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Implications to Alberta of Remaining Independent or Participating In the Canadian Chicken Marketing Agency

by

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A THESIS

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IN

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Supervisor

Date Oct. 17 1983

Abstract

Alberta does not currently participate in the Canadian Chicken Marketing Agency. The national agency is conducting legal proceedings to enforce the Orderly Marketing Regulations upon distributors shipping chicken interprovincially in Canada. By remaining independent, Alberta is likely to be threatened with exclusion from the rest of the Canadian market through enforcement of these regulations. Alberta cannot conduct reciprocal exclusion of interprovincial product in the local market. Potentially, if Alberta cannot produce competitively priced chicken, the local market could be supplied with cheaper product from other provinces.

This study analyzes possible situations in the Alberta broiler industry in the near future. Benefits and costs are outlined for both independent and participant scenarios.

Acknowledgements

The conduct of this wonderful work of art was rendered possible by the assistance of several people. Research funding was received from Alberta Agriculture, Farming for the Future. I am indeed grateful for their support. Jim Huysmans led me by the hand through all the necessary computer programming. This was no mean feat on his part considering every computer that I've ever met has hated me. Don Potter has been very helpful in providing assistance and information on the conduct of the broiler industry, especially in making data available to me. Mel Lerohl has discovered a couple of grey hairs on my account – I'm sorry. Bill Kerr was mercilessly requested to leave the Calgary chinooks and come north. He nobly endured frostbite and grey skies in Edmonton on both occasions. Thanks Bill.

I would also like to acknowledge the support, help and advice from the other members of my committee, and from various people in the department throughout my time here.

p.s. Thanx Mom.

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I. Introduction

Broiler growers in Alberta have enjoyed an expanding market for their product through population growth in the market area and through increasing per capita consumption of poultry products observed in recent years. Population growth in Alberta has been faster than in most other areas in Canada. Per capita consumption of chicken has been steadily increasing in Canada and Alberta since the 1960's.

The economic market area for chicken produced in Alberta has historically included parts of British Columbia, the Yukon and Northwest Territories and some product marketed in Saskatchewan and Manitoba (as well as the province of Alberta itself). The British Columbia market is by far the largest "export" market and receives greater emphasis in the discussion of Alberta's interprovincial marketing within this study. The short-term policy of the Alberta broiler growers is to maintain self-sufficiency in their current economic market area and meet any increasing demand expected to arise from continued population growth.

Marketing of Alberta-produced broiler chicken is conducted within a joint federal-provincial framework. Cooperation between the agents involved has enabled Alberta to market chicken across provincial boundaries and maintain an economic rather than a provincial or geographic market area. Pending policy decisions by either federal or provincial agents could have serious impact on the situation Alberta broiler growers will face in future.

This study is an attempt to identify and clarify some of the results of the alternative policy decisions which may influence Alberta broiler growers to operate within an economic or geographic market area.

A. Purpose of the Study

At the present time the Alberta Broiler Growers Marketing Board is faced with a choice of remaining independent of, or participating in, the Canadian Chicken Marketing Agency. Participation in the national agency implies adherance to national quota allocation but maintenance of an economic market area. Remaining independent allows Alberta to produce chicken according to provincial requirement but interprovincial markets are no longer available. There is not sufficient economic information available to the Alberta

broiler growers to evaluate the alternatives. The purpose of the study is to evaluate alternative situations created by federal and provincial policies and their impact on Alberta broiler growers.

B. Limitations of the Study

There were two sources of unpublished data used in this study, the Alberta Broiler Growers Marketing Board and Alberta Agriculture Poultry Branch. Heavy reliance was made on published data for information on other provinces. A good deal of the discussion was generated from various articles in *Canada Poultryman*.

Data availability limits the extent of this thesis. There are no reliable cost of production figures available for any broiler producers in Canada. The Alberta Broiler Growers Marketing Board discourages its members from participating in any surveys, thus only a small sample of volunteer participants could be obtained from Alberta Agriculture. Likewise, there are no reliable estimates of interprovincial movements of product, or costs of transportation for that product. These two major deficiencies hamper the investigation.

C. Organization of the Study

In the introduction, the nature and purpose of the study is explained.

In Chapter 2, past actions and policies of the various institutions involved in marketing of broiler chicken are outlined.

Chapter 3 provides an outline of the historic development of marketing institutions in Canada particularly pertaining to the marketing of broiler chicken. This includes both federal and provincial agencies as well as the umbrella of legislation which governs the broiler chicken industry.

Aspects of economic theory relevant to this study are noted in Chapter 4. In particular this chapter provides a short review of the theory of economic surplus and the historical controversy over its' appropriate use.

Chapter 5 includes a review of studies concerning demand and supply of chicken. There is some controversy over the methodology most appropriate for these studies. A short discussion of these methodological issues is conducted as they are encountered in

the literature.

The reasons for using the particular methodology of this study are presented in Chapter 6, which outlines the empirical analysis. Chapter 7 is a discussion and presentation of the results of the empirical analysis while conclusions and recomendations for policy or further study are presented in Chapter 8.

II. Background Information to the Study

Marketing of broiler chicken in Canada is carried out by various provincial agencies in cooperation with an overall national agency (the Canadian Chicken Marketing Agency), according to the confines of their respective legislation.

Provincial agencies were operating supply management schemes several years prior to the inception of the Canadian Chicken Marketing Agency. The function of the recent national agency is to coordinate the operation of all the previously established provincial agencies thereby stabilizing interprovincial trade and export.

The Canadian Chicken Marketing Agency does not control import or international export of product. Regulation of international movements is conducted by the Department of Industry, Trade, and Commerce. As Canada participates in the General Agreement on Tarriffs and Trade (GATT), import levels were set based upon historical imports and will continue according to the terms of this particular agreement.

The Canadian Chicken Marketing Agency is responsible for national supply control. This involves the coordination of provincial production (quota allocation) to meet a national production quota. It also involves coordination of interprovincial product movement to alleviate regional surplus or deficit by means of a regulated licensing system.

Allocation of provincial production quotas is a procedure which is conducted annually. The Canadian Chicken Marketing Agency notes historical production patterns to establish a base allocation. Overbase allocations are made according to a set of criteria:

1) change in consumer demand,
2) provincial ability to meet its' allocation,
3) requirements within each market area,
4) self-sufficiency level of each province, and
5) comparative advantage.

Although the agency has established these criteria, there is no method which is consistently followed to determine overbase allocation. Allocations of national quota are appealed and renegotiated according to the internal pressures of the agency.[1] In recent months, members of the agency have requested that a working formula be developed for this purpose.

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[1] For example, the renegotiation of the 1983 quota as can be seen in Table 3-5.

Provincial quotas can be reduced if the particular participating province has produced in excess of its' allocated quota for the previous year. In addition to the compensatory cutback, the province is levied a charge of 5¢ per pound (eviscerated weight) for all tonnage over and above 101% of their allocation. (These cutbacks and fines are also subject to appeal procedures.)

Each provincial agency is responsible for the regulation of its provincial industry such that their particular allocation of national quota will be met. Some provinces in Canada are currently selling product internationally. These provinces are not penalized for this as exports are not subject to national production quota. Table 2.1 shows the regulated and unregulated production recognized by the Canadian Chicken Marketing Agency since commencing operations.

Table 2-1: Regulated and Unregulated Production of Broiler Chicken in Canada. (1979-1982)

(Lbs.* Eviscerated Weight)

Year	Regulated Production	Unregulated Production	Total Production
1982	781,556,000	25,793,419	807,349,419
1981	750,976,000	25,514,695	776,460,695
1980	795,600,000	25,514,695	821,113,295
1979	848,546,000	36,763,419	881,309,419

* Excludes provinces not participating in the Canadian Chicken Marketing Agency.
Source: *Canada Gazette;* Vol.115(II) No. 24:3804 (1982),
Vol.114(II) No. 23:3672 (1981),
Vol.113(III) No. 24:4489 (1980),
Vol.113(II) No. 16:2830 (1979).

Alberta does not participate in the national supply management scheme. Negotiations between the Alberta Broiler Growers Marketing Board and the Canadian Chicken Marketing Agency encouraging Alberta to join are continuing. Past cooperation between these two agencies has enabled Alberta to maintain an interprovincial economic market area after the inception of the Canadian Chicken Marketing Agency.

The Canadian Chicken Marketing Agency has experienced several difficulties in maintaining a stable national market. The major problem has been to deal with the producers in Eastern Ontario who have been marketing without quota since the Canadian

Chicken Marketing Agency began operation. When the Ontario provincial board was instituted there were a dozen or so producers shipping approximately 2 million kgs. of product directly into Quebec. As such, they were exempt from Ontario provincial quota. When the national agency was established, these producers were not given Quebec quota either. Meantime, their numbers had increased to nearly 25 producers and an estimated production somewhere between 14 and 23 million kgs. in 1982. The Canadian Chicken Marketing Agency accepted applications for quota from these producers up until January 1, 1983, and will apparently be issuing quota and interprovincial permits before the 1984 national quota allocations are set.

Some of the problems experienced by the Canadian Chicken Marketing Agency arise simply because there is no accurate record of interprovincial movements of chicken. Illegal production and shipments could be reduced if the transport of product was more closely monitered. (Illegal and unregulated production in Canada was estimated at anywhere between 9 and 27 million kgs. by different sources in 1982.) In order to obtain a better estimate of overproduction and to reduce illegal shipments, the Canadian Chicken Marketing Agency will require an audit of all interprovincial transport permit applicants to determine historical (1980, 81, and 82) interprovincial shipments.

The Canadian Chicken Marketing Agency has allotted an annual quota to Alberta. However, Alberta has overproduced that quota every year except 1979 as it is under no legal obligation to follow it. However, the Canadian Chicken Marketing Agency fails to take this into account each year and national production is consistently higher than target. Some participating provinces have also overproduced their allotted quota, but, there are penalty mechanisms to deal with these provinces. Net result in 1982 was production of 8.3 million kgs. more than expected. A further complication was approximately 2 million kgs. produced for sale to Cuba which was never exported and thus retained on the Canadian market.

The Canadian Chicken Marketing Agency began legal procedings in early spring (1983) to enforce their orderly marketing regulations against agents transporting Alberta-produced chicken into other provinces in Canada.[2] Enforcement of these regulations will be felt first at the processor level as the regulations only apply to product

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[2] Refer to Chapter 3 for a complete discussion of these regulations.

being shipped interprovincially. Speculation is that as Alberta produces more than its national allocation it is unlikely that Alberta processors will be given interprovincial transport permits. Alberta processors object as this would mean that product could be hauled into Alberta from other provinces, but, distributors within Alberta could not haul product out. It is argued that Alberta is definitely not making predatory sales to interprovincial markets since the Alberta cost of production and producer price are among the highest in Canada. It is further argued that Alberta processors should not be treated differently from all others in Canada, and doing so could flood Alberta market with lower priced product from other provinces.

Alberta's historic market area has included British Columbia (eastern regions), the Yukon and Northwest Territories, as well as periodic shipments to Saskatchewan and Manitoba. In 1982 Alberta marketed a large amount of cornish game hens out of province. A major percentage of this product was being marketed in Eastern Canada. At the present time however, the product being moved into eastern British Columbia represents the largest portion of Alberta broiler chicken being marketed interprovincially.

As Alberta does not participate in the Canadian Chicken Marketing Agency, it is viewed by the agency as an unregulated area. The national agency seeks to regulate product from the unregulated market area in interprovincial shipments. Failing to achieve this, the agency seeks to exclude such product from the regulated area. An elaboration of this issue is found in Chapter 3.

By remaining outside of the Canadian Chicken Marketing Agency, Alberta could be limited to a geographic market area (the provincial boundaries). The interprovincial "export" markets, an economic market area, might only be maintained if Alberta were to participate. To date, Alberta has found the quota allocation, and growth in that quota allocation which delimits participation in the Canadian Chicken Marketing Agency, to be unacceptable.

If we examine Table 2.2 it can be seen that the Canadian Chicken Marketing Agency national quota allocated to Alberta exceeded actual production in 1979 but has not done so since that date. There are indications that Alberta would be subject to a cutback in production if it were to participate in the national plan (according to the allocations indicated in Table 2.2). One concern is that Alberta would be reduced to a net "import"

Table 2-2: Canadian Chicken Marketing Agency Allocations to Alberta (1979-1983)

('000 Lbs. Eviscerated Wgt.)

Year	Provincial Allocation	As % Of National	Actual Production
1983 (1)	63,500	7.73	
1983R (2)	64,000	7.79	
1982 (3)	64,973	7.93	74,837
1981	64,973	7.93	75,800
1980	64,428	7.87	67,254
1979	73,000	8.6	68,869

Source: Alberta Broiler Growers Marketing Board unless otherwise noted.
(1) Source: Canada Poultryman Vol. 69(11):32.
(2) Source: Canada Poultryman Vol. 69(12):26; R = Revised.
(3) Source: Canada Poultryman Vol. 69(5):7.

situation if it were to comply with the terms of the national plan. This study prepares a comparison of a net provincial import situation (through participation in the Canadian Chicken Marketing Agency) to the resulting situation if Alberta is limited to a geographic market area (within its provincial boundaries).

III. Development of Marketing Institutions in the Canadian Broiler Chicken Industry

Although agricultural cooperatives have existed in Canada since the late 1800's, the first attempt to regulate agricultural markets was in British Columbia with the passage of the British Columbia Produce Marketing Act of 1927. Tree-fruit producers suffering from low prices and ineffective voluntary cooperation pressured their provincial government for a stronger means of control. In response, the legislation granted authority to establish an agency which would control the marketing of tree fruits, establish prices and collect levies to cover cost of operations. The Supreme Court of Canada struck down the Act in 1931 because it controlled interprovincial movements and imposed an indirect tax.

The British North America Act did not clearly specify limits to federal and provincial jurisdictions in marketing. It did however, clearly indicate that in the case of conflict, the federal legislative power would prevail.[3] During the depression of the 1930's, political pressure was exerted on the federal government to bring forth legislation that would clarify the situation and allow more orderly / stabilized marketing of farm products in Canada. As a result, the Natural Products Marketing (Canada) Act was passed in 1934. The Dominion Marketing Board was established to supervise marketing plans under this Act.

The Dominion Board had jurisdiction over interprovincial and export trade. Regulation of intraprovincial trade was to be granted to provincial authorities. In order to be able to regulate both quantity and quality of farm products being marketed, all producers in any area were required to be licensed.

In 1936, the Supreme Court of Canada ruled that the Natural Products Marketing (Canada) Act of 1934 interfered in intraprovincial marketing. The Privy Council of London, England, upheld the decision and the act was repealed in January 1937.

During the short time the Natural Products Marketing Act was in place, twenty two marketing plans were approved by the Dominion Board. However, only fourteen of these were in operation when the act was repealed in 1937. As the Act had been subject to considerable controversy at the time of its' passing, several provinces anticipated the Federal repeal and prepared provincial legislation to serve the same purpose. British

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[3] See Richter (1973).

Columbia passed the Natural Products Marketing (British Columbia) Act in 1936, followed by Ontario and New Brunswick in 1937.[4] These provincial marketing acts enabled most of the active plans to remain in operation.

The issue of national marketing legislation was pushed aside for the period of World War II. The federal government passed the War Measures Act - 1939[5] which enabled complete control over all aspects of agricultural marketing as was deemed necessary in the national interest. Efforts to draft the required legislation were renewed after the war, beginning with consultations between the federal government and the Canadian Federation of Agriculture in 1945. These negotiations produced the Agricultural Products Marketing (Canada) Act of 1949, amended in 1957 and 1970.

Institution of either federal or provincial marketing Acts did not immediately result in operating marketing schemes. Marketing schemes had to be approved by a majority of producers before the proposed scheme would be authorized by an order in council. Each approved marketing plan was under surveillance of an appropriate federal or provincial supervisory marketing council. The marketing plans themselves were operated by a composite group of elected producers, government appointees, other industry members and consumer representatives.

Several provincial marketing schemes were successful in stabilizing their product markets and raising prices. Higher prices encouraged the inflow of product from other provinces. During the late 1960's several trade disputes arose as various provinces attempted to maintain closed markets and local prices at an elevated level.[6]

Pressure from various producer groups was exerted for legislation that would enable regulation of interprovincial trade and "dumping" practices. After long debate, the federal government passed the Farm Products Marketing Agencies Act in 1972 (also known as Bill C - 176) to provide an opportunity for interprovincial trade disputes to be resolved. The Act enabled, but did not require, national marketing agencies to be established. The Farm Products Marketing Agencies Act of 1972 established the National

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[4] The other Canadian provinces enacted similar legislation at later dates; Manitoba: 1939, Prince Edward Island: 1940, Saskatchewan: 1945, Nova Scotia: 1945, Alberta: 1955, Quebec: 1956, and Newfoundland: 1966.

[5] The War Measures Act pertaining to World War I was not applicable in World War II.

[6] The most notorious of these disputes involved movements of chicken and eggs between Quebec, Manitoba, and Ontario. Each province attempted to maintain a closed market and several instances of predatory marketing practices were observed. It has been labelled the "Chicken and Egg War".

Farm Products Marketing Council. This council was to be appointed with equal representation from each of: a) the four western provinces, b) the two central provinces, and c) the Maritimes. At least 50% of the members were to be primary producers, and one of the Chairman or Vice-Chairman was also to be a primary producer. This national council was responsible to the federal minister of Agriculture and was charged with the supervision of all national marketing agencies established under this act dealing with interprovincial trade and export.

Products previously regulated under the Canadian Wheat Board or the Canadian Dairy Commission (both crown corporations) are exempted from further regulation. It is interesting to note that section 18.3 of the Farm Products Marketing Agencies Act limits that no agency is empowered to implement any determination of the quantity in which any regulated product may be marketed **except** in the case of eggs and poultry (and parts thereof).

In the event that the marketing agency established under the act be empowered to administer production or marketing quota, the Farm Products Marketing Agencies Act delineates how that quota should be allocated in section 24. Initial allocation was made on the basis of the production from that area in relation to the total production of Canada over a period of five years immediately preceding the effective date of the marketing plan. Any growth in the market, and therefore in quota base, was to be allocated according to the principles of comparative advantage in production. Clearly this was an attempt by the federal government to reduce consumer price as far as possible in future years. However, as Loyns (1972) notes, there will be difficulty in demonstrating the amount of advantage any one region has over another.

The Canadian Chicken Marketing Agency was proclaimed in February 1979. The agency is supervised by the National Farm Products Marketing Council and is subject to the Farm Products Marketing Agencies Act of 1972. The agency functions to establish national and provincial production quotas, and to regulate interprovincial movement of this product to achieve a nationally stable market environment. Import quotas and international tariffs are determined by the Department of Industry, Trade and Commmerce subject to GATT regulations.

Producer price for broilers is set by provincial agencies, often based upon cost of production formula among other factors. Provincial agencies are also responsible for determining who will produce by establishing minimum or maximum size of operation, and regulating transfer, retention and allocation of quota.

The Canadian Chicken Marketing Agency established quota in August 1979 for the calendar year 1979. These are shown in Table 3-1. (Note that Alberta and Newfoundland are included in these allocations even though neither province participated in the national plan during 1979.)

Table 3-1: 1979 Canadian Production Quota Set by the Canadian Chicken Marketing Agency

('000 Lbs. Eviscerated Weight)

Province	Allocation	% of National
B.C.	91,000	10.72
Alta.(1)	73,000	8.60
Sask.	17,170	2.02
Man.	34,500	4.07
Ont.	294,000	34.65
Que.	277,000	32.64
N.B.	21,700	2.56
N.S.	30,000	3.54
P.E.I.	1,176	0.14
Nfld.(1)	9,000	1.06
Canada	848,546	

(1) Non-participating provinces.
* Percentage calculations mine.
Source: *Canada Gazette* Vol. 113(III) No. 16:2830.

Under the Canadian Chicken Orderly Marketing Regulations the Canadian Chicken Marketing Agency established quotas for agents in unregulated areas wanting to market in a regulated area. In doing so the agency attempted to take account of economic market areas. Three things were taken into consideration when establishing these quotas:

a. The capability of a province to meet its quota;

b. The historical proportion of market demand for chicken in a province that is a regulated area that is met by production of chicken in that province and by chicken marketed in that province by persons in a province that is an unregulated area; and

c. The existence of predatory marketing practices by persons in a province that is

> an unregulated area when marketing into a province that is a regulated area including the shorting of a market traditionally supplied for the purpose of supplying an interprovincial market not traditionally supplied.[7]

The Agency further delimited the unregulated areas in section 4 of these regulations.

> "No person in an unregulated area shall engage in the marketing of chicken in interprovincial trade into a province that is a regulated area as a dealer, producer, processor, producer-processor or retailer unless a quota has been allotted to that person by the Agency."[8]

These quotas established the maximum production which might be authorized for interprovincial trade. The Canadian Chicken Anti-Dumping Regulations outlined the minimum price for which any product could be sold in a regulated area - regardless of whether the origin of that product was regulated or unregulated. Through these measures the Canadian Chicken Marketing Agency was expected to effectively regulate (and thereby stabilize) the marketing of broiler chicken in Canada, thus resolving any further trade disputes.

Marketing of broiler chicken within Alberta is subject to the Marketing of Agricultural Products (Alberta) Act of 1955, amended 1970 and 1972. The Alberta Broiler Growers Marketing Board was established in 1965 through an order in council under the Alberta Broiler Growers Marketing Plan. Several subsequent regulations for the conduct of the Alberta Broiler Growers Marketing Board have also been passed under this plan. (The content of these amendments and regulations do not form a part of this study.) Operations of the Board are supervised by the Alberta Agricultural Products Marketing Council established in 1955.

Alberta does not participate in the Canadian Chicken Marketing Agency. From a national perspective, product from this region would be viewed as unregulated. The Farm Products Marketing Agencies Act indicates how unregulated product might be dealt with in interprovincial trade.

Section 2.e.v. of the Farm Products Marketing Agencies Act provides authority to authorized national agencies (i.e. the Canadian Chicken Marketing Agency) to enforce a system of licensed marketing of regulated product in interprovincial or export trade. Regulated product is described in section 2.g., especially 2.g.ii. where it states that

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[7] *Canada Gazette* Vol. 113(II) No. 16 p.2834.
[8] *Canada Gazette* Vol. 113(II) No. 16 p.2833.

Table 3-2: 1980 Canadian Production Quota Set by the Canadian Chicken Marketing Agency

('000 Lbs. Eviscerated Weight)

Province	Allocation	% of National
B.C.	92,000	10.53
Alta.(1)	69,300	7.94
Sask.	21,000	2.40
Man.	33,000	3.78
Ont.	298,000	34.12
Que.	295,000	33.78
N.B.	23,000	2.63
N.S.	31,500	3.61
P.E.I.	2,100	0.24
Nfld.(1)	8,500	0.97
Canada	873,400	

(1) Non-participating provinces.
* Percentage calculations mine.
Source: *Canada Gazette* Vol. 113(III) No.24:4487,4489.

Table 3-3: 1981 Canadian Production Quota Set by the Canadian Chicken Marketing Agency

('000 Lbs. Eviscerated Weight)

Province	Allocation	% of National
B.C.	88,000	10.65
Alta.(1)	65,524	7.93
Sask.	18,012	2.18
Man.	33,500	4.06
Ont.	284,669	34.46
Que.	271,424	32.86
N.B.	22,271	2.70
N.S.	31,000	3.75
P.E.I.	2,100	0.25
Nfld.(1)	9,500	1.15
Canada	826,000	

(1) Non-participating provinces.
* Percentage calculations mine.
Source: *Canada Gazette* Vol. 114(III) No.23:3670,3672

Table 3-4: 1982 Canadian Production Quota Set by the Canadian Chicken Marketing Agency

('000 Lbs. Eviscerated Weight)

Province	Allocation	% of National
B.C.	90,433	10.65
Alta.(1)	67,335	7.93
Sask.	18,506	2.18
Man.	34,423	4.06
Ont.	292,531	34.46
Que.	278,915	32.86
N.B.	22,886	2.70
N.S.	31,859	3.75
P.E.I.	2,156	0.25
Nfld.	9,847	1.16
Canada	848,891	

(1) Non-participating province.
* Percentage calculations mine.
Source: *Canada Gazette* Vol. 115(III) No.24:3802,3804.

Table 3-5: 1983 Canadian Production Quota Set by the Canadian Chicken Marketing Agency

('000 Lbs. Eviscerated Weight)

Province	Initial Allocation	% of National	Revised Allocation	% of National
B.C.	85,200	10.36	86,000	10.46
Alta.(1)	63,500	7.73	64,000	7.79
Sask.	23,700	2.89	21,370	2.60
Man.	33,500	4.08	33,402	4.06
Ont.	276,200	33.61	282,650	34.40
Que.	274,300	33.38	269,300	32.78
N.B.	21,600	2.63	22,920	2.79
N.S.	30,100	3.66	30,749	3.74
P.E.I.	3,200	0.39	1,600	0.19
Nfld.	10,400	1.28	9,663	1.18
Canada	821,800		821,654	

(1) Non-participating province.
* Percentage calculations mine.
Source: *Canada Poultryman* Vol.69(11):32, 69(12):26.

regulated product is grown or produced.....

> "in any region of Canada designated in the proclamation that authorizes an agency to exercise its' powers in relation to any such product grown or produced in that region, or in any such region and anywhere in Canada outside that region for shipment into that region in interprovincial trade and not for export where the proclamation that authorizes the agency to exercise its' powers in relation to such product so provide."

In designating the powers of the proclaimed agency, section 23.e. states that the agency may.....

> "designate bodies through which any regulated product in relation to which it may exercise its powers or any variety, class or grade of any such product shall be marketed in interprovincial or export trade."

From these quotations it would appear that the intent of the Farm Products Marketing Agencies Act is to provide means for complete control of interprovincial movements. The Canadian Chicken Marketing Agency Proclammation Act has given the agency the authority to carry out this function. In delineating the powers of the agency the proclamation reads.....

> "such powers may be exercised in relation to a) chickens and parts thereof produced anywhere in Canada except in the Provinces of Alberta, Manitoba and Newfoundland; and b) chickens and parts thereof produced in the Provinces of Alberta, Manitoba and Newfoundland for shipment into the rest of Canada in interprovincial trade and not for export."[9]

This proclamation was amended in August of 1979 and February of 1981 to include Manitoba and Newfoundland respectively. Alberta remains the only non-participating province in Canada.

Clearly **all** interprovincial shipments of broiler chicken in Canada are to be regulated and coordinated by the Canadian Chicken Marketing Agency. The legislation does not allow for the existence of non-participants conducting interprovincial trade in broiler chicken. The licensing regulations for the Canadian Chicken Marketing Agency were discussed but not legislated until June 1981, coming into effect August 1, 1981. Section four of that document states.....

> "No person shall engage in the marketing of chicken in interprovincial or export trade as a producer, producer-processor, processor, dealer, or retailer unless he holds the appropriate license (set out in section 7) and pays to the Agency annually the fee prescribed by that section for that license."[10]

It can be surmised from the legislation that Alberta has been able to maintain an economic market area in Canada simply through cooperation with the other agents

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[9] *Canada Gazette* Vol. 113(II) No. 4 p. 641.
[10] *Canada Gazette* Vol. 115(II) No. 14 p. 1971.

involved. The purpose of this study is to examine the possible situations which would arise if any of the agents involved in the marketing of broiler chicken alter their current policies or conduct.

IV. Theory of Economic Surplus

In order to understand the conduct of the analysis it is necessary to understand not only the underlying theory but also to understand the development of that particular body of economic thought. The following chapter outlines the development of the body of thought used in this research and the problems in its use.

Economic rent or surplus has been a longstanding feature of economic theory. The earliest definition appears in mercantilist literature as the agricultural surplus remaining after seed and farmer's subsistence are removed from the harvest.[11]

Adam Smith regarded rent as a residual bonus between the price received for a commodity and the payments to wages, interest, and entrepreneurial efforts.[12] David Ricardo further developed this concept of differential surplus in his analysis of land rent.

Ricardian rent accrues to land of superior quality when diminishing returns force the cultivation of inferior lands and competition maintains price at a level which is sufficient to cover cost of production on the least productive land in use.[13] The amount of rent landlords could amass was therefore dependent upon the fertility of the particular land parcel, location, monopoly power, etc. Ricardian rent in this sense is not a cost of production and therefore it is not price determining.[14,15]

John Bates Clark is largely credited for the generalization of Ricardian land rent principles into marginal productivity theory. Marginal productivity theory applies to the demand for, and supply of, all productive factors to hiring firms. In Ricardo's analysis variable amounts of capital and labour are applied to a fixed supply of land; no rent occurs at the margin because the marginal product of labour and capital are exhausted by wages and interest. The same principle was applied, assuming fixed supplies of labour or capital to show that an analagous rent would accrue (up to the margin) according to the marginal product of all productive factors. All factors will be rewarded according to their marginal productivities (with underlying assumptions of perfect competition). In other words; total product will be exhausted when each factor is paid the equivalent of its' marginal

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[11] Rima (1978).
[12] The "natural price"; all of these payments were required in order for the commodity to be supplied at all.
[13] Rima (1978), p. 171.
[14] Rima (1978), p. 145.
[15] (Refinement of this principle is associated also with Thomas Malthus and later with Nassau Senior and John Stuart Mill.)

product.[16]

Recalling that "natural price" is simply the appropriate payment to wages, interest, and profits necessary to induce production of a commodity, it can be deduced that this would be equivalent to the social cost of that commodity (again under assumptions of perfect competition). Recall that classical economic theory postulated that all rents would disappear in the long run due to competition. Marginal productivity theory therefore indicates that under conditions of perfect competition in the long run, all factors of production will receive a real rate of return equal to the social value of their marginal physical product.

Knut Wicksell was concerned with the circumstances under which total product would not be exhausted by rewards to the productive factors – especially increasing or decreasing returns. With increasing returns, the value of total product is too small to reward all factors according to their marginal products. Conversely, in the case of decreasing returns, a surplus will remain after all factors are rewarded. However, Wicksell noted that neither increasing nor decreasing returns are likely to prevail in the long run.[17]

As can be expected from this discussion, time is an important parameter to be considered in the analysis of rent. Alfred Marshall described the rents accruing in the short run as "quasi-rents": returns to factors which are temporarily in excess of the value of their marginal products.[18] In the long run quasi-rents are eliminated when the supply of the productive factor is no longer fixed.

If all units of a factor of production are homogenous, then the reward to the marginal unit will be exactly equal to the reward of the average unit, and thus no opportunity for rent will exist. If in the long run, the supply of productive factors is less than perfectly elastic, the short run quasi-rents are capitalized and embodied in the long run cost and supply curves. If quasi-rents or rents are embodied in the cost curves, it would follow that if price was determined by cost of production, then rents would be price determining. Recall that in the pure Ricardian analysis rent is a residual surplus and therefore is not price determining.

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[16] Rima (1978).
[17] Rima (1978).
[18] Rima (1978), p. 305.

Differences between these two analyses of rent stem from the types of problems which were being addressed. Ricardo was trying to explain the incomes of various social classes. Marshall was dealing with the problem of exchange value of commodities and their associated factors of production.

> "Since the problem of exchange value always relates to particular commodities, Marshall recognized that part of the expense of producing a commodity is the competitive price it is necessary to pay for land (*or other productive factors*[19]) in order to take it away from its' other uses. In this case, rent is a necessary payment."[20]

The difference between rent definitions received far less attention after Marshall presented price determination as an interaction between forces of supply and demand and departed from the classical notion that cost of production determined price.

All concepts of rent discussed thus far have defined it as a surplus over and above the amount necessary to induce a factor into use.[21] This is most commonly described as the area above the supply curve and below the prevailing price. Wessell (1967) describes the difference between Ricardian rent and the concept put forward by Pareto: the excesss earnings over the amount necessary to keep the factor in its' present occupation. The Pareto concept is concerned with **where** a factor will be supplied – not simply **if** it is supplied, the Pareto concept is concerned with opportunity costs of competing uses.

Another difference between these definitions is in orientation. Ricardo's definition is economy–oriented. Pareto's definition is user–oriented.

> "Paretian rent from the point of view of any individual user of a factor is determined by how his demand influences the price of a factor assuming the demands of all other users to be present in the market. It is clear that the sum of these influences is not necessarily the same as the sum of the consequences when all of the individual demands are added or subtracted from the market at the same time..... In addition we must remember that, when any user adds his demand to the factor market, the price rise he produces generates "rents" not only for himself but also necessitates additional payments by all other users of the agent."[22]

Wessel comments that, although perhaps interesting, these multiple rent concepts are of little practical value. One argument in favour of the Pareto concept is that it allows a compromise in the debate whether rents are price–determined or price–determining. However, as Wessell continues, rents are neither price–determined nor price–determining since both price and rent are co–determined as a result of the interaction between other

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[19] Italics mine.
[20] Rima (1978), p. 298.
[21] These concepts have been developed most notably by Ricardo, Dupuit, and Marshall.
[22] Wessell (1967), p. 1123, 1224.

larger forces of supply and demand.

Worcester (1946) elaborated on the differences between Ricardian and Paretian rent. He noted that due to the differences in approach to the question of rent it was not likely that the two would coincide in empirical analysis. He suggested that marginal analysis[23] would be more appropriate as it would include all elements of cost, both real and opportunity.

> "Economic surplus can arise only where there are differences among the various buyers or sellers of an identical article in respect of their willlingness to buy and sell. What is the same thing in other words, it is a phenomenon necessarily associated with less than perfectly elastic demands and supplies."[24]

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[23] (According to the marginal productivity theory discussed earlier in this chapter.)
[24] Boulding (1945), p. 851.

A. Controversy Over and Uses of Economic Surplus

Various concepts of producer and consumer surplus are widely used by economists. It is a useful tool in examining benefits of international trade. If the belief that competitive equilibrium results in an optimum is held, then economic surplus can be used to measure welfare effects of resource misallocation in an economy.[25] In consumers surplus the "basic idea is to evaluate the value to a consumer or his "willingness to pay" for a change in price of good from say p^0 to p^1. Because price changes affect consumer welfare, an evaluation of this effect is often a key input to public policy decisions."[26]

When Marshall introduced the notion of producer surplus it was apparently an attempt to show the similarities between producer and consumer surplus.[27] However, consumers are a relatively homogenous group as compared to the diverse group of producers or sellers. Sellers may refer to those selling either factors of production, intermediate good or final products. Producers themselves may be owners of firms or owners of factors of production. The widely accepted definition is that producers refers to owners of all factors of production.

The common measure of producers surplus is the area above a supply curve below a price line. Exactly what this area measures is somewhat confusing. "In the short run, the area above a competitive firm's short-run supply curve and below the price line provides a measure of the "excess of gross receipts over prime costs" since the firms short-run supply curve coincides with its' short-run marginal cost curve. This surplus, formally equivalent to "quasi-rent", is attributable to the short-run fixity of some factors of production."[28]

In the long run there would be no fixity of the factors of production and therefore no quasi-rents. By definition the long-run competitive equilibrium is the minimum of the long-run average cost curves for all firms which excludes the possibility of rents accruing to any firms. At first glance the issue would appear to have settled itself in the long-run. However, the costs to the firm for the factors of production may include rents or

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[25] Harberger (1954) noted that although there may be concern about resource allocation and national income, his study on national income accounts indicated it did not have strong national effect. He did however note that the income distribution effects of resource misallocation would be more serious.
[26] Hausman (1981), p. 662.
[27] Currie *et. al.* (1971) p. 754.
[28] Currie *et. al.* (1971) p. 755.

surpluses over and above the minimum amount necessary to elicit their services. While these may be costs to the firm they are not real costs to society.[29] Thus the area above the supply curve might represent these rents if it is an average cost curve including rents as well as a marginal cost curve excluding rents.

There are very few situations which meet the requirements of Ricardian rent and thereby indicate a single curve in short-run and long-run. One example is the pure Ricardian case of a fixed supply of land and unlimited supplies of other factors. Diminishing returns to land would be observed on land but the supply curve would be the long-run average cost curve as well as the long-run marginal cost curve including rent - therefore the area above the supply curve represents the true "rent". Currie *et. al.* (1971) also noted that the same situation would occur even if the supply of the single limiting factor was not fixed but simply not perfectly elastic. In the absence of technological change, this situation would be analogous to the pure Ricardian example of land.

Mishan (1968) noted that this Ricardian condition would not hold if there were more than one limiting factor of production.

> "The industry supply curve is, admittedly, an average cost curve including rents - the rents of both factors in fact, since these alter as the industry's equilibrium output expands. But it is NOT also a marginal curve **excluding** rent (as in the Ricardian average cost curve). An average curve including rent, equal to a marginal curve excluding rent, can be derived only in those cases in which rent accrues to a single fixed factor, all other factors being infinitely elastic. In the more general case, however, where the changes in rents of all factors are fully taken account of in the average curve, including of course the rental of capital (but no Knightian profit), the area above the rising industry supply curve carries no economic significance."[30]

Currie *et. al.* (1971) point out that rent will disappear in the long run only under perfectly competitive situations. Under imperfectly competitive situations "firms may receive a surplus in the long run as well as in the short run, for there is no inevitable force ensuring zero excess profits in the long run. Such a surplus results from some degree of market power. In the case of monopoly, it is essentially a rent from being the only seller in the market".[31]

Hicks (1945) outlined consumer's surplus with reference to price: "Compensating variations measure the loss of income, taking place after the fall in price, which would

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[29] (Shepherd (1970) argued that only payments above those necessary to obtain the desired **mix** of commodities are socially unnecessary.)
[30] Mishan (1968) p. 1277.
[31] Currie, *et. al.* (1971), p. 758.

make the consumer no better off than he was before the fall took place. Equivalent variations on the other hand, measure the gain in income taking place at the higher price, which would give the same gain in satisfactions as the fall in price gives."[32]

Mishan (1959) demonstrated that economic rent is symmetrical with consumers surplus (but with reference to supply price). Both measures consider the welfare of an indidividual when a given set of prices change.

Currie *et. al.* (1971) summarized Mishan's producer compensating and equivalent variations in this way:

"Compensating variation is the amount of compensation, paid or received, that will leave the factor owner in his *initial* welfare position following the change in price if he is free to supply any quantity after compensation.

Compensating surplus is the amount of compensation, paid or received, that will leave the factor owner is his *initial* welfare position following the change in price if he is constrained to supply the quantity he would have supplied at the new price in the absence of compensation.

Equivalent variation is the amount of compensation, paid or received, that will leave the factor owner in his *subsequent* welfare position in the absence of the price change if he is free to supply any quantity after compensation.

Equivalent surplus is the amount of compensation, paid or received, that will leave the factor owner in his *subsequent* welfare position in the absence of the price change if he is contrained to supply at the old price the quantity he would have supplied at that price in the absence of compensation."[33]

These different definitions of surplus lead to the definition of two types of supply curves, ordinary supply curves (OSC) and compensated supply curves (CSC). The ordinary supply curve is derived from an individual firm's preference map – it shows the quantities that would be supplied at the various prices. (Note that it is possible to have a backward bending supply curve in some cases if there is a large value placed on leisure and the producer is subject to a time constraint.) The compensated supply curve shows the product that would be supplied at any price if the producer is compensated to remain on the same indifference curve. (Note this precludes the existence of a backward bending supply curve.)

Criticisms of economic rent have been leveled in many areas. Harberger (1971) described five particular areas where consumer surplus has been labelled deficient.

a. The analysis is valid only when the marginal utility of real income is constant.

b. The analysis does not take count of changes in income distribution caused by

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[32] Hicks (1945) p.69.
[33] Currie *et. al.* (1971) p. 760.

the action(s) being analyzed.

c. The analysis is partial equilibrium in nature, and does not take account of the general-equilibrium consequences of the actions whose effects are being studied.

d. The analysis, though valid for small changes, is not so for large changes.

e. The concept has been rendered obsolete by revealed-preference analysis.[34]

Harberger then developed arguments to refute each of these criticisms in turn. He begins by stating that the assumption of constancy of marginal utility of income is not essential for the validity of consumer surplus. Using a Taylor expansioned utility function he determined that the second order conditions describing changes in the utility function would also describe changes in consumer surplus. This could be converted to monetary terms by dividing it by the marginal utility of income, which need not be constant in order to carry out this division. Harberger further defended the concept on the grounds that even though it may hold bias if the marginal utility of income does change over the period of analysis, it is still dealing with only a minute portion of GNP and therefore, in any one study, the bias in the results is not serious.

A major criticism directed at the surplus concept is that it doesn't consider distributional aspects. Harberger noted this and described the necessity of having distributional weights applied to the appropriate data. However, he went on to note that it was not likely that any concensus among analysts involved could be reached on the assignment of those weights, therefore it would be a far more practical idea to leave the analysis as it was.

Harberger noted that a good many of the cost-benefit and surplus analyses have been partial equilibrium approaches. However, he goes on to point out that it was a direct result of the particular study and those conducting it, rather than a fault of the theory itself which is general equilibrium.

On the notion of the validity over small changes only, Harberger points out that rarely do these types of studies ever involve zero-consumption vs some other consumption alternative. While agreeing that the functions would be less well-behaved outside the target neighborhood, he proposed that his framework of postulates would alleviate these grievances and provide the best approximations in practical situations.

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[34] Harberger (1971) p. 786.

Harberger's framework for applied welfare economics. were the following three basic postulates:

a. The competitive demand price for a given unit measures the value of that unit to the demander;

b. The competitive supply price for a given unit measures the value of the unit to the supplier;

c. When evaluating net benefits or costs of a given action, the costs and benefits accruing to each member of the relevant group should be normally added without regard to the individual(s) to whom they accrue.[35]

One of the major assumptions in economic analysis is that economic agents are unconstrained. Optimum conditions will evolve through competition, consumer choice, etc.[36] At this optimum, maximum welfare for all will be achieved.

When constraints do exist, the optimum may or may not be reached depending upon the nature of the constraint. Lipsey and Lancaster (1956) noted that there are no *a priori* means of determining the new optimum under constrained conditions, however, they define it clearly.

> "It is well known that the attainment of a Paretian optimum requires the fulfillment of all the optimum conditions. The general theorem for the second best optimum states that if there is introduced into a general equilibrium system a constraint which prevents the attainment of one of the Paretian conditions, the other Paretian conditions, although still attainable, are, in general, no longer desirable. In other words, given that one of the Paretian optimum conditions cannot be fulfilled, then an optimum situation can be achieved only by departing from all the other Paretian conditions. The optimum situation finally attained may be termed a second best optimum because it is achieved subject to a constraint which, by definition, prevents the attainment of a Paretian optimum.[37]

The use of economic rent concepts should be conducted with some caution. However, recognizing the limitations of the method, it provides a tool of economic analysis.

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[35] Harberger (1971) p. 785.
[36] Adam Smith described this process as the "invisible hand" which would guide the economy to optimum conditions.
[37] Lipsey and Lancaster (1956) p. 11.

V. Literature Review of Supply and Demand Studies

A. Theoretical Review of Demand Analysis

Statistical analysis of consumer demand requires a clear understanding of the data before any calculations are carried out. Interpretation of the calculated parameters is subject to the limiting assumptions used and methodological constraints.

The data set often used for demand analysis are paired observations of prices and quantities of product moved at the retail, wholesale, and farm levels. It is not immediately obvious whether a regression line through these points is a supply or demand curve as the observations represent intersections of the two. Working (1927) was among the first to discuss this identification problem. He enlarged on four important aspects:

a. Whether the supply or the demand curve is more variable; noted observations trace the least variable curve.

b. The market level being observed.

c. The extent of *ceteris paribus* limitations.

d. Whether shifts in supply and demand curves are correlated or random, or restricted in any way.

Working stated that statistical demand curves approximate a relation at a particular point in time (or over a particular period of time) according to the assumptions made about continuing conditions.

There are several alternative models which can be used in a demand analysis. Unfortunately there are no strong *a priori* specifications to determine the most appropriate model in given situations. In fact, Kuznets (1953) states

> "It is ordinarily possible, and in a serious study it would appear desirable, to experiment with several different formulations as well as with various versions of the same model."[33]

Hassan and Johnson (1983) examined quarterly data between 1965 and 1976. Their purpose was to examine some of the commonly used practices in quarterly demand analysis. Common practice is usually to "use ordinary least squares with seasonal dummies in linear regression analysis of seasonally unadjusted time series data. The approach is based on a hypothesis of fixed and constant shifts in the intercept for each of the

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[33] Kuznets (1953) p. 885.

quarters."[39] They formulated six alternative methods of estimation and used root mean square error (RMS) to evaluate and compare methods.

a. Ordinary least squares – no seasonal effects (OLS).

b. Ordinary least squares – fixed effects.

c. Generalized least squares – random effects (GLS).

d. Generalized least squares – fixed and random effects.

e. Error components model.

f. Seemingly unrelated regressions.

"Results for the demand models with alternative seasonality hypotheses are quite different, implying researchers should exercise care in selecting a representation for seasonality that is consistent with the process generating the data, the thoery, and the institutional setting governing population from which the sample is drawn."[40]

Examining the within-sample errors they found the formulations followed a consistent pattern: OLS (fixed effects) ranking highest; followed by GLS (fixed and random effects); OLS (no seasonal effects); SUR; and Error components model in roughly that order. Examining the RMS errors for outside-sample data showed a much different pattern which varied by commodity. They found that the GLS (fixed and random effects) ranked first for chicken, the OLS (fixed effects) and Error components model also performing well.

They conclude that unless very strong *a priori* information exists for use of fixed dummy variables[41] one should proceed more cautiously using models involving random effects as a more appropriate alternative.

Fox (1954) questioned the use of multiple vs. single equation approaches to the measurement of demand.....

> "I accept the proposition that many economic phenomena must be explained in two or more simultaneous relationships. However, single – equation methods appear to be both practically and theoretically appropriate for estimating many structural relationships in the field of food and agriculture."[42]

Since Fox published that article there have been many refinements in techniques for both approaches and computer programs to calculate them.

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[39] Hassan and Johnson (1983) p.77.
[40] Hassan and Johnson (1983) p.77.
[41] (As in the demand for Christmas turkey for example.)
[42] Fox (1954) p. 57.

Table 5-1: RMS Percentage Errors for Alternative Seasonality Models obtained by Hassan & Johnson (1983)

(Results shown only for Chicken Demand Models)

Sample Period	OLS-No Seasonal Effects	OLS Fixed Effects	GLS Random Effects	OLS Fixed& Random	Error Components	SUR
Within Sample 1965-1976	7.56	5.32	7.53	5.36	8.09	7.77
Outside Sample 1977	12.18	6.37	12.64	6.26	7.63	11.52

Source: Hassan and Johnson (1983) p.91,92.

The functional forms used in the analysis of demand for food products have often used either a linear or log specification. Chang (1977) discussed several established notions and their importance in choice of functional form in the estimation of demand. It is known and documented that once a certain subsistence level is reached, the rate of food consumption increase slows as levels of income rise, hence income elasticities of demand for food would be expected to fall, (demand for food becoming increasingly inelastic).[43]

Tomek (1965) attempted to demonstrate falling demand elasticities for broiler chicken over time using quarterly U.S. data spanning 1949 - 1964. Heavily reliant on previous work done by Stanton (1961) he began by analyzing scattergrams of his data and found two logical groups to exist. These two groups formed the basis of his linear regressions. Tomek found the elasticity of demand to be slightly less in the second and later time period, suggesting that consumer demand for chicken did follow theoretical patterns.

Chang (1977) noted that a linear functional form implies that the income elasticity of demand is rising and tends toward unity (if it is less than unity). This is clearly inconsistent with the theory and empirical studies mentioned above.

The logarithmic functional form implies that the income and price elasticities of demand are constant at any level of income or price. This may be a restrictive notion if

[43] Refer to Goreux (1960) and Tomek (1965).

Table 5-2: Observed Changes in Elasticity of Demand for Broilers Obtained by Tomek (1965)

Sample Period	Years Spanned	No. of Observations	Own Price Elasticity
1	1949 - 1956(Q1)	28	-2.68
2	1956(Q2) - 1964	32	-2.33

Source: Tomek (1965) p. 801.

Table 5-3: Income Elasticity of Demand for Meat in the U.S.A Estimated by Chang (1977).

Year	$ Per.Cap. Income	Linear Form	Log Form	General Form
1935	1035	0.351	0.493	0.647
1940	1259	0.352	0.493	0.579
1950	1646	0.454	0.493	0.492
1955	1795	0.439	0.493	0.506
1960	1883	0.466	0.493	0.487
1965	2239	0.534	0.493	0.468
1970	2610	0.558	0.493	0.403
1974	2846	0.606	0.493	0.402
MEAN		0.479	0.493	0.493

Source: Chang (1977) p. 358.

price and income variation is large within the data set.

Chang (1977) formulated a general equation, of which the log and the linear are only specific cases, and described the limitations and appropriateness of all three. He conducted empirical tests using all three formulations on the same demand data spanning the years 1935 - 1974 and a maximum likelihood method. Using the general functional form, he found the income elasticities to in fact be falling over time as would be expected from theory and supported in other empirical studies. The logarithmic form yielded a constant elasticity which was equal at the mean with the general formulation. The validity of a linear model, (yielding increasing income elasticities over time), was statistically rejected.

Chang summarized by noting that the income elasticity of demand for meat is declining, but since the rate of decline is slow, the logarithmic form is an acceptable approximation if the range in income levels and prices are limited.

A logarithmic specification is often used for convenience in addition to the accompanying theoretical notions. The estimated coefficients can be directly interpreted as elasticities if the equation is normalized with respect to the quantity coefficient.

Learn (1956) noted that equations tend to be more stable when expressed in percentage terms than in actual values. To the extent that this is true, a logarithmic formulation would then be preferable. Holmes (1968) notes that by assuming constant elasticities with the logarithmic formulation the possibility of saturation is ruled out. He therefore recommended the using reciprocals of the data and a linear formulation.

Hassan and Johnson (1979) attempted to further clarify the issue of appropriate functional forms. They experimented with different functional forms and transformations of variables using a maximum likelihood technique on Canadian data between 1965 and 1976 to estimate demand equations for beef, pork, veal, chicken and turkey. Their results show that linear methods slightly overestimated both price and income elasticities of demand for chicken, while double logarithmic, semi-logarithmic and inverse methods underestimated both elasticities as compared with the general form. They found that the functional forms which best approximated the demand structure in question varied between the commodities being determined. For chicken, the semi-log and double-log forms could not be statistically rejected. However, they add that "errors on the order of 100% are possible in elasticities estimated from structural forms within the family but not optimal for the data"[44]. Examination of Table 5.4 illustrates this point.

Hassan and Johnson (1979) use the general form as their standard and compare all other results to it. Theory and empirical analysis in Chang support their choice. (Note that this implies the estimates of own price and income elasticities of demand from the general functional form would also be considered the most reliable in their study.)

The type of data base being used will have effect on the nature of the analysis posing some unique difficulties. Time series data need be deflated to a common year. In the case of retail prices, a retail price index is usually readily available and appropriate. In the case of farm prices a more unique deflator is required, and is not usually so readily available. If the data being used is from family budget information it will be expressed in units of expenditure, not quantity. This will probably result in an overestimation of the

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[44] Hassan and Johnson (1979) p. 10.

Table 5-4: Elasticity Estimates from Alternate Functional Forms Obtained by Hassan and Johnson (1979)

(Estimates shown for chicken only)

Functional Form	R^2	Own Price Elast.	Own as % of General	Income Elast.	Income as % of General
Linear	.8990	-0.7640	104.35	0.6300	101.20
Double log	.9082	-0.6511	88.93	0.5673	91.13
Semi. log	.8909	-0.6056	82.72	0.5335	85.70
Log.Inverse	.8293	-0.4206	57.45	0.3794	60.94
Inverse	.8671	-0.3717	50.77	0.3401	54.63
General	.9110	-0.7321		0.6225	

Source: Hassan and Johnson (1979) p.11.

income elasticity of demand as compared with time series data because as income rises, expenditures include improved quality of purchase as well as increasing quantity of purchases.

George and King (1971) compare data from U.S. household food consumption surveys between 1955 and 1965. They attempted to divide the expenditure elasticity into quantity and quality components. Using ordinary regression analysis on data from a household food consumption survey taken in 1965, they estimated expenditure elasticity and quantity and qualtiy components for a number of commodities. For chicken they estimated the expenditure elasticity to be (0.056); the quantity elasticity (-0.034); and the quality component (0.090). In discussing their results they noted "it is expected that the quality elasticity is positive because higher-income groups tend to consume more expensive or fancy grades and varieties. Also, upgrading of diets, with increased income is reflected in the fact that changes in quantity consumed may not be so large as changes in expenditure on food items."[45]

A method for combining time series and cross sectional data must subtract the quality elasticity (as measured with respect to price) from the quantity elasticity (all elasticities measured with respect to income). As the endogenous variable in cross sectional analysis is quantities, and price in time series analysis, the estimated parameters do not directly correspond between the two systems. Algebraic means of transposing the parameters may not adequately deal with the associated disturbance terms.

[45] George and King (1971) p.72,73.

George and King found that chicken consumption increased over all income groups between sample dates. Comparison of the regression lines for 1955 and 1965 showed a significant increase in the intercept coefficient and a significant decrease in the slope coefficient. This meant that the differences between income groups were becoming less (lower income groups experiencing a larger percentage increase than higher income groups). Income elasticity of demand for all food remained stable between sample periods. They noted a variation in elasticity of demand for chicken of 0.05 to 0.10 between the highest and lowest income groups.

The time frame of the sample period will have an effect not only on the sample elasticity estimates by also in the difference between market levels. For example, there may be seasonal differences which do not appear in annual observation. It is expected that these differences, and differences between market levels, will disappear because the product will have been moved through the entire system.

Pasour and Schrimper (1965) investigate the effect of length of adjustment period on measured demand elasticities. They also analyze the demand for storage stocks of a commodity. (Demand in short periods of time arise in part from a storage activity, more so than in longer periods of time. The other force affecting the elasticity of demand over longer periods of time is the elasticity of substitution with other commodities.) They found that demand for use was more elastic in the long run, and demand for storage was more elastic in the short run.

Manderscheid (1964) noted that some authors argue that the price elasticity for a commodity first becomes more inelastic as the adjustment period increases, and then, becomes more elastic as the adjustment period continues to be lengthened. It would then be possible to have a U – shaped plot of elasticity vs adjustment period. However, the work by Pasour and Schrimper (1965) does not support this when the demand for storage stocks of commodity are taken into consideration.

Time series demand analysis is subject to debate over the most appropriate method for estimating long run elasticities. There are basically two approaches; one proposed by Working (1954) and adapted by Ladd and Tedford (1959), the other proposed by Nerlove (1958) and Nerlove and Addison (1958).

The Working model is based on a system of moving averages of both quantity and income related to current price. It is based on two components; the current year, and a moving average of the last five years. Both Kuznets (1953) and O'Regan (1955) strongly criticize the model. They do not agree that the current consumption is intuitively linked to deflated indices of previous prices. Gislason (1957) on the other hand supports the Working model in that consumer response to price changes is not instantaneous and therefore is likely to be affected by price information from previous years.

> "In fact, the values of the long run variables at any point in time are not independent of the path taken by the short run variables in reaching that point. Thus, analysis of long run demand is essentially a phase of dynamic analysis."[46]

The Nerlove model is based on distributed lagged information. The model allows for lags in prices, income and quantity. It also includes expectations (and thereby a distribution of uncertainty). Ironmonger (1959) strongly disputed the notion that "inertia" on the part of consumers, although existing, could explain the long run trends in food consumption.

Manderscheid (1964) provides a summary article on seven problems areas in deriving and interpreting price and income elasticities of demand.

a. Nature of the observations; ie. time series data.
b. Length of the adjustment period.
c. Length of the sample period.
d. Stage in the marketing process.
e. Controlled / uncontrolled and interrelated variables.
f. Functional form.
g. Estimation procedures.

All of these points and their implications have been discussed in some detail in this review.

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[46] Gislason (1957) p. 802.

B. Consumer Demand for Chicken

Many comprehensive studies have been conducted on consumer demand for both food and nonfood items. These studies vary from sectoral models to those focussing on single commodities. Demand for broiler chicken is often analyzed in models of consumer demand for selected meats and poultry. Consumer demand studies can be conducted with a variety of time units. Those most commonly used are monthly, quarterly, or annual periods. The frame of analysis can be time-series or cross-sectional.

Stanton (1961) attempted to analyze seasonal variations in U.S. broiler demand. Preliminary regression analysis through quarterly price consumption data indicated two distinct relationships: summer (quarters 2 and 3) and winter (quarters 1 and 4). His data spanned 1953 - 1959, prices and incomes deflated by consumer price index and all data converted to logarithms.

Stanton's first model is a price dependent regression to derive price flexibility coefficients.[47] He found that the only significant variable in summer equations to be the price flexibility coefficient, whereas in winter the coefficients for beef, pork, and consumer income are important. He suggested that the "outdoor" uses of broilers in the summer months, and competition from turkey and other products in the winter months would explain the "stronger" summer demand for broilers.

Stanton developed demand elasticities by two quantity dependent methods. The first is using reduced form equations, the second is using a simple single equation approach. In comparing the two methods Stanton finds conflicting evidence on seasonal demand differences. Reduced form equations delivered the "expected" significant variables in summer and winter, however, the single equations yielded coefficients of "expected" magnitude. He concludes that his original hypothesis regarding seasonal differences are neither disproved nor strongly supported. Some of Stanton's results are presented in Table 5.5.

In presenting his method of analysis Stanton expressed concern on two problems dealing with seasonal differences. The first was a parallel shift in demand according to season, and the second was a change in the nature of demand. In order to circumvent these identification problems Stanton ran separate analyses for the two seasons in order

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[47] Price flexibilities measure the percentage change in price associated with a 1 percent change in quantity demanded.

that these differences were not assumed by the method of analysis. Logan and Boles (1962) attempted to clarify this issue.

Logan and Boles analyzed U.S. price-consumption data for the period of 1948 - 1959, in quarterly time periods. Their purpose was to test the two hypotheses: the slopes of the demand functions were constant by season within the year, and the level of the demand functions are constant among seasons of the year.

The results of their study are interesting. They did not find any significant difference betweeen the slopes of the seasonal demand functions, however, they did find significant differences in the level of the seasonal demand functions. Contrary to Stanton they did not find any good reason to combine any of the four seasonal equations.

It is also interesting to note their resulting coefficients comparing broilers to beef and pork. They found that in the broiler equation, beef and pork consumption coefficients are negative, indicating that they are considered substitutes for broilers. In the beef and pork equations however, the coefficient on broiler consumption was found to be positive, indicating that broilers are not considered substitutes for beef and pork.

Logan and Boles used two equational specifications for their direct demand relationships. The first, a simple linear relation, in the second specification the data were transformed into logarithms. They found that the linear specification resulted in lower sums of squared residuals than the logarithmic specification but found the values of elasticities to be the similar with both methods.

Using reduced form equations and a quarterly model, Logan and Boles estimated price flexibilities. A summary of their results is presented in Table 5.6.

In attempt to further clarify the seasonal nature of broiler demand, Farris and Darley (1964) conducted a study of U.S. monthly price-quantity relations at the farm level. Similar to earlier findings of Logan and Boles, they found no significant difference between the slopes of seasonal demand curves, but did find significant difference between the level of the demand curve for each season, increasing as expected during the "summer" season.

Data in the Farris and Darley model spanned the years 1953 - 1963. Observations between 1953 and 1957 were lagged three months, and observations between 1958 and 1963 were lagged two months. This was done to incorporate at least some of the

Table 5-5: Seasonal Price Flexibilities and Demand Elasticities For Broilers Obtained by Stanton (1961)

	Winter Season	Summer Season
Price Flexibility	-0.707	-0.593
Own Price Elasticity		
1) Reduced Form	-1.256	-2.239
2) Single Equation	-1.290	-1.189
Income Elasticity		
1) Reduced Form	+3.663	+0.311
2) Single Equation	+2.164	+1.085

Source: Stanton (1961) p. 10, 11.

Table 5-6: Price Flexibilities and Demand Elasticities For Broilers Obtained by Logan and Boles (1962)

		Season			
	Annual	Q1	Q2	Q3	Q4
Price Flexibilities					
Log.	-0.305				
Linear		-0.303	0.360	-0.365	-0.317
Own Price Elasticities					
Log.	-3.179				
Linear		-3.069	-2.588	-2.545	-2.930

Source: Logan and Boles (1962) p. 1059.

changing structure of the poultry industry into their model. Coefficients were estimated from simple linear and logarithmic specifications by OLS.

Farris and Darley found that their linear model had a higher R^2 for the months of June to October (summer), whereas the logarithmic model yielded higher R^2 between November and May (winter). A relevant summary of their results is shown in Table 5.7.

Lee (1973) attempted to analyze and provide quantitative measures of the determinants of demand for poultry meat in order to develop a forecasting model of the Canadian poultry meat sector. He used logarithms of monthly data spanning 1963 - 1970 in a two stage least squares regression analysis.

Interpretation of Lee's results is difficult as a high degree of serial correlation was observed in all of his models. In comparing his estimated elasticities with others in the literature, they appear to be over-estimated. Lee discussed the nature of farm-level

Table 5-7: Price Flexibilities and Elasticities of Demand for Broilers At The Farm Level Obtained by Farris and Darley (1964)

Month	Price Flexibility	Elasticity (Log.)	Elasticity (Linear)
Jan.	-0.72162	-1.38577	-1.37238
Feb.	-0.70269	-1.42310	-1.33374
Mar.	-0.72736	-1.27484	-1.23954
Apr.	-0.79791	-1.25327	-0.12462
May	-0.85119	-1.17483	-0.10852
June	-0.87041	-1.14888	-0.10943
July	-0.96798	-1.03308	-0.97526
Aug.	-0.97357	-1.02715	-0.92118
Sept.	-1.01651	-0.98376	-0.84520
Oct.	-0.99549	-1.00453	-0.84236
Nov.	-0.89889	-1.11248	-0.95403
Dec.	-0.65081	-1.53655	-1.40954

*Computed at the means of the variables for each month.
Source: Farris and Darley (1964) p.852,855.

Table 5-8: Estimates of Elasticity of Demand for Broiler Chicken Obtained by Lee (1973).

Market Level	Elasticity
Retail	-4.1861
Wholesale	-1.8048
Farm	-3.7145

Source: Lee (1973) p. 212.

poultry pricing in Canada and the possible effects of administered pricing. He suggested that the policy of the provincial boards would behave as a missing variable in statistical analysis. His results are presented in Table 5.8.

Holliday (1978) presents a quadratic programming spatial equilibrium model of the relationships in the Canadian broiler industry. He analyzed quarterly data between 1963 and 1975. to estimate demand elasticity in a two stage least squares analysis (which appears to have been linear). He used farm price of broilers indicating that his calculated elasticities are farm level in both his calculations for Canada and the United States.

Considering that Holliday deals specifically with broiler chicken, which is not directly comparable to total chicken, it is difficult to compare the results of his study with others in this literature review.

Table 5-9: Price and Income Elasticities obtained by Holliday (1976)

Farm Level

Elasticity	Canada	U.S.A.
Own Price	-0.4389	-0.3515
Income	1.3811(1) 0.0563(2)	+0.4493

(1) Second quarter 1963 to third quarter 1970.
(2) Fourth quarter 1970 to second quarter 1975.
Source: Holliday (1976) p.75,76.

Some of the observed differences could be due to methodological differences: Holliday used quarterly data and dummies for time period and income changes over a different sample period. His model included demand for closing stocks which would also affect the nature of his model. (Demand for closing stocks is also noted in the discussion by Pasour and Schrimper (1965).)

Brandow (1961) constructed a U.S. consumer demand model relationship matrix for twenty-four farm products including meat, poultry, dairy, crops, feedgrains and oilseeds. The purpose of his model was to describe long run tendencies in the total agricultural sector (consumer, export and industrial markets) and provide information useful in policy formulation. Brandow relied heavily on homogeneity and symmetry conditions[41] to derive a matrix of demand relationships at the retail level. The data base in Brandow's estimated model are average 1955-1957 prices, margins, and market clearing quantities. Variables are initially converted to logarithms of their annual values.

The first section of his model develops these demand relationships at the retail level. Brandow analyzes marketing margins to determine a price relation between retail and farm prices. Substituting these derived price relations for each product back into his complete matrix formulation, Brandow recalculates the demand functions to determine the demand parameters at the farm level. A partial summary of Brandow's retail and farm level coefficients are presented in Table 5.10.

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[41] a.) The homogeneity condition states that the sum of the cross-price, own-price and income elasticities for a particular commodity equal zero.
b.) The symmetry condition states that knowing the value of one cross price elasticity coefficient permits the calculation of the other between commodities.

Table 5-10: Price Flexibilities and Elasticities of Demand for Chicken Obtained by Brandow (1961).

	Retail Sector	Farm Sector
Price Flexibilities	-0.950	-1.4907
Elasticities		
Own Price	-1.16027	-0.7357
Income	+0.3700	

*Calculated at the means of 1955-1957 data.
Source: Brandow (1961) p. 17,65.

The study conducted by George and King (1971) dealt with forty-nine commodities or food commodity groups in much the same manner as Brandow. One goal of their study was to construct a matrix of demand interrelationships for the United States dealing with both cross sectional (1955 and 1965), and time series (1948 - 1968) data.

George and King develop a complete demand analysis at the retail level. They develop a few relationships at the farm level through analysis of marketing margins using elasticity of price transmission. George and King define the elasticity of price transmission as the "ratio of relative change in retail price to the relative change in the farm level price".[49] Knowing the elasticity of retail demand, and calculating the elasticity of price transmission for several commodities, the farm level elasticity of demand was shown to be simply the product of the elasticity at the retail level and the elasticity of price transmission.[50] Table 5.11 shows some of their calculated parameters at the farm and retail level.

Tryfos and Tryphonopoulos (1973) use a system of linear demand functions for beef, pork, veal, lamb and chicken to estimate the appropriate parameters through two stage least squares analysis and Seemingly Unrelated Regressions (SUR) technique.[51] Canadian prices and income data spanning 1954 - 1970 were deflated to 1961 levels. They found a relatively high income elasticity of demand for chicken, and a fairly low own price elasticity of demand. They suggest that this is due to a change in tastes over time

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[49] George and King (1971) p. 61.
[50] This method is used later in this paper. (See Methodology, Chapter 6.) M. Nerlove presents a similar analysis of related farm and retail price through the elasticity of price transmission in: Foote, R., (1958).
[51] Seemingly Unrelated Regressions: The SUR method is attributed to Zellner, A., 1962, "An Effiecient Method for Estimating Seemingly Unrelated Equations and Tests for Aggregation Bias", *American Statistical Association Journal*, Vol. 57:348-368.

Table 5-11: Elasticities of Demand at Farm and Retail Levels Obtained By George and King (1971)

	Retail Level	Farm Level
Own Price Elast.	-0.777330	-0.602348
Income Elast.	+0.178490	
Elasticity of Price Transmission	+0.774894	

Source: George and King (1971) p. 46,64.

that is highly correlated with income. There is no support found for this suggestion in other studies. Tryfos and Tryphonopoulos did not obtain significant regression coefficients, nor were all coefficients of expected sign.

Hassan and Katz (1975) used both the SUR and Full Information Maximum Likelihood (FIML)[52] methods. They found the results from the FIML method to be more reliable with lower standard errors.[53] Hassan and Katz (1975) estimated their parameters from Canadian time series data (1954-1972) using a complete set of logarithmic demand equations using similar commodity classifications as Tryfos and Tryphonopoulos: beef, pork, veal, lamb, chicken and turkey. They tested their model by comparing their predicted values for 1973 with preliminary data published by Statistics Canada. Estimates for Fowl and Chicken exceeded the actual consumption by a maximum of 6.0%. See Table 5.13.

A recent analysis of consumer demand interrelationships in Canada was conducted by Hassan and Johnson (1976). They divided their data into twenty-seven different food commodities and commodity groups based on data quality, data availability, and the purpose of the study. (One purpose of the study was to estimate parameters for policy formulation and forecasting.) Logarithmic data spanning 1957 - 1972 was used for the meat and poultry regressions, prices are deflated to 1961 levels. They used two methods of regression - SUR and FIML. Results of both methods yielded parameters of expected signs, magnitude, which were statistically significant. They found that parameters

[52] Full Information Maximum Likelihood Method: FIML estimates require complete specification of the model and are subject to bias with small samples. Parameters are non-linear. The model is extremely sensitive to specification error.

[53] In comparing SUR and FIML estimators, the FIML estimators are found to have smaller standard errors although they are similar in size and magnitude to those obtained through SUR techniques. (See Hassan and Katz (1975), and Hassan and Johnson (1976).) It is also noted in Hassan and Katz (1975) that in smaller samples when the disturbance terms are correlated, the FIML estimators yeild lower variance than SUR estimators.

Table 5-12: Price and Income Elasticities of Demand for Chicken Obtained By Tryfos and Tryphonopoulos (1973).

Own Price Elasticity	Income Elasticity
-0.087	+1.129

Note that regression coefficients in this model were not significant.
Source: Tryfos and Tryphonopoulos (1973) p.651.

Table 5-13: Price and Income Elasticities of Demand for Chicken Obtained by Hassan and Katz (1975).

	Elasticity	Method	Period
Own Price	-0.4458	SUR	1954-1972
Income	+0.6922	SUR	1954-1972
Own Price	-0.4499	FIML	1954-1972
Income	+0.6898	FIML	1954-1972
Own Price	-0.5339	SUR	1957-1972
Income	+0.7061	SUR	1957-1972
Own Price	-0.5637	FIML	1957-1972
Income	+0.7295	FIML	1957-1972

Source: Hassan and Katz (1975) p. 55-58.

Table 5-14: Price and Income Elasticities of Demand for Chicken Obtained by Hassan and Johnson (1976)

	Elasticity	Method
Time Series Data		
Own price	-0.5339	SUR
Own price	-0.5637	FIML
Income	0.7061	SUR
Income	0.7295	FIML
Cross Section(1)		
Income	0.1490	

(1) Data from Hassan and Lu, (1974)
Source: Hassan and Johnson (1976) p.28,40.

estimated with FIML methods were of similar magnitude but slightly smaller standard errors than those estimated with SUR.

Using data from their regression equations in comparison with other published

results,[54] Hassan and Johnson construct a complete matrix of demand interrelationships at the retail level. Table 5.14 presents aspects of their matrix pertaining to chicken demand in Canada.

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[54] Drawing especially from Hassan and Lu (1974).

C. Theoretical Review of Supply Analysis

Supply literature deals primarily with the theory of the firm, developing average cost curves, marginal cost curves, and envelope curves, etc. Statistical analysis of supply response posed some difficult theoretical and empirical identification problems. Supply response is observed output response to price and other factors.

> Supply elasticities indicate the speed and magnitude of output adjustments in response to changes in product price".[55]

However, as Learn (1956) pointed out, producers respond differently under different time frames. In the short run producers may market their product at the "best price" they imagine they will receive. In longer term, producers may in fact be responding to relative price ratios among substitute enterprise products.

Cassels (1933) developed an early article on the nature of statistical supply curves. He noted three types of Marshallian supply curves; the market curve (essentially a storage and dealer supply curve fluctuating at the whim of the current market): the short run normal curve (dealing with the existing means of production): and the long run normal curve (dealing with long run principles of increasing and decreasing returns).

Cassels clearly indicated the importance of time and the difference between these curves in discussing different supply response functions over differing time periods.

> "There is no curve which can be regarded as the one and only supply curve for any particular commodity. ...What we have .... is a whole series of supply curves for each commodity representing all possible conditions between the most perfect long run normal adjustment and the most rigid momentary fixity of supply."[56]

Nerlove (1958) stated the same notion within his article on the theoretical considerations of supply elasticities.

> "...It can be shown that the short run elasticity of supply for an individual firm are always less than or equal to the long run elasticity, and that the longer the time allowed for adjustment, the closer the short run elasticity to the long run. Thus from any point on a long run supply schedule, we may think of a fan of curves which gradually approach the long run curve."[57]

The existence of uncertainty and expectations affects the nature of the supply response. If there are incorrect beliefs about the behaviour of prices and incomes, then there is no guarantee that the short run supply response curve will ever approach the long run supply (normal) curve. Nerlove concludes by saying

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[55] Tweeten and Quance (1969) p. 342.
[56] Cassels (1932) p. 382.
[57] Nerlove (1958) p. 301.

> "Thus, there is no unique short run elasticity of supply .... with respect to price or any other variable, the short run elasticity differs depending upon the position from which we start and the length of time allowed for adjustment."[58]

Cassels also presented an argument for what is now incorporated as part of asset fixity theory.[59] He noted that a large increase in supply price was necessary to elicit extra production, but only a small increase in supply price was required to maintain that extra production over longer periods of time. Therefore, time was an important factor because the organization and reorganization of productive factors was not instantaneous. As certain factors of production may be more difficult to move once they have been allocated, Cassels states that the process of contraction is not simply a reversal of the process of expansion in supply response.

> "Each supply curve must be regarded as relating to a particular level of output and should be recognized as having two distinct parts, one representing expansion beyond that output and the other representing contraction below it."[60]

Glenn Johnson (1958) noted that weaknesses in the analysis of aggregate production functions stem from the classical and neoclassical notions of marginality which form the basis of those functions. The rate at which the marginal productivity of variable inputs declines depends upon the proportion of fixed inputs, the levels at which they are fixed, and the degree of substitutability or complementarity between fixed and variable resources. Johnson stated that such analyses did not explain how assets were determined fixed in any manner except in length of run.

The fixed asset theory purports to explain these phenomena at least in part. Perhaps the clearest and most concise definition of the theory is found in Johnson and Pasour (1981):

> "The theory is used only for questions of farm resource adjustment at a moment in time. Acquisition and salvage prices are evaluated simultaneously and, at any moment, a decision maker chooses among three options: to expand, to contract, or to continue unchanged."[61]

Resources will be allocated to the highest return usage. Resources will remain "fixed" in a particular use until such time as their marginal value product (or value in use) is less than their salvage value (or opportunity cost). Clearly, if the value in use does not

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[58] Nerlove, (1958), p. 304.
[59] The theoretical supply price is that which the expectation of would call forth a given supply.
[60] Cassels, (1932), p.384.
[61] Johnson and Pasour (1981) p. 5.

warrant acquisition of additional rsources, nor does it fall below its' salvage value, then that resource shall remain "fixed" in its' present use.

Johnson (1972) noted that the neoclassical competitive model assumed that variable factors of production could be disposed of at their purchase price. As such, mistakes of investment could be corrected without loss. Johnson and Pasour (1981) elaborated on this aspect of loss.

> "The fact that resources might have been better placed originally is irrelevant from the standpoint of current allocative efficiency. Stated differently, sunk costs are irrelevant to current decisions. Furthermore, mistakes are inevitable when operating under real world conditions of risk and uncertainty."[62]

D. Gale Johnson is noted for his discussions of uncertainty and supply response.[63] Uncertainty may lead producer to discount future returns as an informal hedge to establish a safety margin or reserve. (Formal hedges might also be used such as insurance policies etc.) Diminishing return to variable inputs combined with uncertainty would lead to underproduction.

Glenn Johnson did not accept this proposition. In Johnson & Quance (1972) he stated that the model failed to account for tendencies to overinvest or to account for differences in elasticities of expansion and contraction.

The tendency to overinvest might be better explained if it is considered as a means to incorporate flexibility into the production unit. This would in part explain the differences in expansion and contraction elasticities. Another might be related to the perceptions of the conditions. Perhaps negative feedback is discounted more than positive indicators. D.G. Johnson (1950) suggested that in periods of contraction the opportunity costs of inputs might also be falling due to the general economic conditions in agriculture, leaving their present use still the most profitable among a given set of alternatives. Support for this suggestion is easily understood when the agricultural production unit is highly specialized.

T.W. Shultz (1958) offered the notion that improvements in technology and the labour input in production would lead to improvements in the output:input ratio. Again this would be an expansionary force and may be one of the factors in explaining different supply elasticities in different situations. Shultz however did not note that the

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[62] Johnson and Pasour (1981) p.5.
[63] See for example D.G. Johnson (1950). He is referenced in works by G.L. Johnson as well.

specialization of agricultural production units could also lead to more favourable input : output ratios.

Supply analysis is far more subject to institutional confinements and expectation than demand analysis. Time and response to uncertainty over time strongly affect supply elasticities.

D. Chicken Supply Response

There have been few studies conducted on chicken supply response. The analyses which have been done are often poultry industry models. Only recently have there been publications on the actual supply function (or functions).

An early model of the poultry industry in the USA was presented by Fisher (1958) where he constructed a system of linear equations based on 1915–1940 data which he used to calculate both short and long run parameters using a limited information method. (Long run parameters estimated through the use of a lagged model.) This data base limits the appropriateness of his study in current studies. Chicken meat production within his sample period was a secondary operation to egg production and poultry farmers could easily switch from one production entity to the other. Modern poultry farms are physically specialized to the extent where this opportunity is removed. Similarly, there are institutional frameworks now in existence which limit the ease with which a farmer may transfer between types of production.

The results of this model are interesting because they reflect the unique nature of the poultry industry that no longer exists. He found own price elasticity of supply to be positive in both the short and long run models. Feed price elasticity of supply was positive in the short run and negative in the long run models. This reflects the fact that chicken production was residual to eggs: when feed price increased the cost of egg production increased which would probably lead to increased culling of laying hens and thereby increased supply of chicken meat. In the long run production would be more elastic. If feed prices increased, chicken meat production itself would become less profitable and supply would decrease – a negative elasticity.[64]

Heien (1976) contructed a recursive model to explain the behaviour of the U.S. poultry meat sector including both retail demand and production relationships. Using his constructed model Heien analyzed price and quantity response to exogenous changes in aggregate income or price level, prices of poultry substitutes and input cost variables. Heien used wholesale price of poultry in his model as opposed to farm price due to the strong vertical integration making identification of farm–level prices very difficult.

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[64] This is of course assuming that product prices were not linked to feed prices, considering the lack of market integration in the US at this time, this assumption is reasonable.

Heien set forth a small argument for the use of ratios rather than direct data in deriving cost functions. He noted that according to theory, prices and costs entered in ratios in supply relations will preserve homogeneity. In his discussion he also noted that the main reason for not using ratios in such estimations is that not all input cost data are available. He argued that if input cost data are not complete, a bias will exist in any specification of a model. He further argued that bias in the ratio form can be managed fairly easily, and added that the ratio formula conserves degrees of freedom.

Heien's developed production relations for chicken and broiler chicken are simplified in Table 5-15. He found the important factors in broiler production were time, own price, feed cost, cost of processing, and the capacity of the industry. Production of chicken other than broilers (for example cornish game hen or roasters) is an enterprise that is often secondary to broiler production although both are sensitive to stocks of product in storage.[65] Non-broiler chicken production was found to be less strongly affected by own price, feed cost, and processing costs and not at all by the capacity of the industry. It was far more strongly affected by time than was broiler production.

Heien used his model to analyze the large increases in poultry retail prices observed in 1973. (44.3% for broiler chicken, 32.9% for turkey.) His calculations indicated that "all exogenous variables except beef, pork, and fish could have resulted in an increase of 10.2 percentage points. The remaining 34.1 percentage points of the observed 44.3 percent increase was a result of increases in prices of substitute meats."[66]

Increases in feed costs in 1972 led to decreases in the supply of beef (-4.6%), pork (-7.3%), and chicken (-2.2%) in 1973. Heien reassigned broiler price increases to causal factors in a second explanatory model. The feed price increases accounted for 14% of the broiler price increases. He attributed 16.7 percentage points of the broiler price increases to be due to the recursive effects of decreasing supply, and rising prices of beef, pork, and broilers simultaneously. (The residual percentage points were attributed to general inflation, fish price increases, and other factors.)

Heien noted that in further analyses the price changes would be difficult to separate out from the effect of the 1973 price freezes on meat and poultry that were

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[65] In Alberta cornish game hens and roasters are grown on a permit basis only - not regular quota.
[66] Heien (1976) p. 315.

Table 5-15: Chicken and Broiler Production Relations Estimated by Heien (1976).

Commodity	Explanatory Variable	Partial Elasticity
Broiler Chicken	WPBrCk/FC	0.36
	WPBrCk/PWR	0.11
	Indust.Cap.	0.95
	Time	0.28
Chicken (Non Broiler)	WPBrCk/FC	0.06
	WPBrCK/PWR	0.12
	Time	-0.98
	Time^2	0.42

WPBrCK = Wholesale price of broiler chicken.
FC = Feed cost variable.
PWR = Wage rate in the processing industry.
Indust.Cap. = Production capacity in the industry.
Source: Heien (1976) p. 312.

enforced at that time.

Chavas (1982) raised some theoretical questions on the estimation of supply functions. As previously mentioned in the discussion of the Heien article, economic theory suggests that if all relevant input and output prices are included, then aggregate supply functions are homogenous of degree zero in prices. Chavas stated the contribution of this to economic theory is the proposition that prices should be interpreted only in relative terms. For this reason, models often employ price ratios rather than absolute prices.

Chavas went on to note that models often only include a subset of the relevant prices for reasons of data availability or problems of multicollinearity. He stated that if only a subset of the relevant factors are included in the model, then the resulting functions are interpreted as equilibrium functions; the excluded prices adjusting endogenously to the changes in the included prices. In that case the homogeneity condition would not be likely to hold.

Chavas' study focussed on tests of homogeneity. His model was based on data from 1965 to 1975 (quarterly). Price and feed cost variables were converted to logarithmic form for 2 reasons: a) they yielded a closer fit than the linear formulations, and b) to provide a basis for homogeneity testing. Lags were used to approximate the biological growth and response periods in the industry.

Chavas indicated that if price ratios are used, it would impose the restiction that, in each equation, the elasticity with respect to price would be equal to the elasticity with respect to feed costs. He tested this homogeneity restriction using an F-test.

Results of Chavas (1982) are indicated in Table 5.16. He suggested that at a 5% level of significance, the validity of the price ratio is accepted for broiler production but rejected for broiler placement and broiler hatching. In studying equations for all three stages simultaneously, price homogeneity is rejected at the 3% level of significance.

Chavas summarized by pointing out that where the homogeneity conditions were rejected were the same stages where maximum adjustment took place in the industry. He concluded that the use of price ratios would result in model misspecification.

The supply section of the quadratic programming model by Holliday (1978) was formulated using polynomial distributed lag functions. Supply is an endogenous variable which enters the model recursively. He did not attempt to estimate supply elasticities.

One very useful aspect of Holliday's research was the development of a transportation cost matrix for Canada. Canadian transport rates do not accurately reflect costs, therefore, he extrapolated backwards from US data using an annual index of meat shipping costs in the US to derive costs for broiler chicken. His cost matrix is regional, dividing Canada into British Columbia, the Prairies, Ontario, Quebec, the Maritimes and the US market.[67]

Chavas and Johnson (1982) present a model where dynamic production decisions are made in particular production stages. They attempt to provide a model where the biological lags in production can be incorporated.

Chavas and Johnson divide the industry into four sections:

1. Placement – the number of chicks placed in hatchery supply flocks.
2. Testing – for pullorum-typhoid disease in hatchery supply flocks.
3. Hatchery – number of chicks hatched for final production in commercial hatcheries.
4. Production – final production.

Each section is analyzed separately but yet as part of a single production process.

There are some qualifications to the study regarding structure of the US industry. The US industry is very strongly vertically integrated. Chavas and Johnson note that most

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[67] See Appendices.

Table 5-16: Supply Elasticity by Stage of Production Obtained by Chavas (1982).

Sector	Elasticity w.r.t feed cost	Elasticity w.r.t own Price (wholesale)	Prob.(F)
Placement	-0.483(2)	0.710(2)	0.05
Hatching	-0.147(1)	0.240(1)	0.05
Production	-0.037(1)	0.072(1)	0.11
All Three Equations			0.03

* Numbers in parentheses indicate data lags used in the model. Source: Chavas (1982) p.354,355.

production decisions are through vertically coordinated managements from hatchery supply flock right through to final production. For this reason, they use wholesale rather than farm price in their analysis.

Chavas and Johnson discuss the dynamics of supply with respect to the different levels. The largest economic adjustments are expected in the first stages of the process. As each stage imposes decisions on the following stages, the short-run elasticity of supply approach zero in the final stages. Differences in elasticity between stages in their model were found to be significantly different at the 10% level of significance for broilers.

Chavas and Johnson (1982) find that supply elasticities with respect to feed cost and own price are significant at the ten percent level with the expected signs. Elasticities are larger at the placement level, the first stage of production, and differences in elasticity between stages is significantly different. They suggest that the elasticities are limited by the biological nature of production itself. From their data it can be seen that the testing and production sections are the least flexible stages. Intuitively this is a reasonable result; hens placed in supply flocks remain there for at least six months before production and testing. Similarly, once birds are placed for final production there are few possible changes until that flock of birds has been marketed. The hatchery sector is somewhat more elastic than the testing or production stages. Again this is intuitively reasonable. The eggs being set by a hatchery are regulated by a much shorter production cycle (only three

Table 5-17: Supply Elasticities obtained by Chavas and Johnson (1982).

Production Stage	Elasticity w.r.t. Feed Cost	Own Price Elasticity (wholesale)
Placement	-0.259	0.601
Testing	-0.119	0.023
Hatching	-0.106	0.192
Production	-0.026	0.064

Source: Chavas and Johnson (1982) p. 561.

weeks), but the number of eggs set is still subject to the availability of hatching eggs from the supply flocks. Thus it is not surprising that the placement in supply flocks is the most important locus of economic decisions in a strongly vertically integrated and coordinated U.S. industry.

E. Discussion of the Literature Review

The preceeding literature review has dealt with aspects of supply and demand for chicken. These concepts are essential to the approach used in the following methodology chapter. As noted in the introduction, the limitation of data, especially concerning cost of production and thereby supply response, limits the possibilities of the study. Thus a full supply and demand model, using the concepts presented in this review, could not be constructed. Methodology used in this study is based in concept on the understanding of chicken supply and demand behaviour as described here.

VI. Methodology

The supply and demand model constructed here makes use of producer surplus / economic rent concepts to measure effects of alternative federal and provincial policies on the Alberta broiler industry. The first section of the chapter deals with some modeling methodology using rent concepts found in the literature.

As the analysis is conducted at the producer level, consumer level demand is transformed to corresponding farm level demand relationships. The second section of the chapter deals with the particular transformations and appropriate theory.

The third section of the chapter deals with the development of alternative scenarios and estimation of the appropriate curves within the models.

A. Studies in Canadian Agriculture Using Economic Rent

There have been several recent studies conducted on the social costs of regulation in Canadian agriculture. Most of these studies attempt to identify income transfers as well as industry efficiency losses using an economic rent methodology.

The research report by Barichello (1981) outlines this type of methodology most clearly. The objective of his work was to describe and quantify the costs and benefits of Canadian milk industry regulations. After estimating the supply and demand curves for milk, and assigning elasticities to these curves at their observed values or points of intersection, he estimated the different costs as indicated by the appropriate areas under the curves. As Barichello was forced to make some assumptions regarding his assigned elasticities, he conducted a sensitivity analysis using a range of intuitively reasonable elasticities.

Grubel and Schwindt (1977) conducted a similar type of analysis on the British Columbia Milk Board. Again they conducted a sensitivity analysis on their applied elasticities, interest or discount rates, and period of projections.

Borcherding and Dorosh (1981) identified social costs and consumer to producer transfers in British Columbia as a result of the British Columbia Egg Marketing Board and the Canadian Egg Marketing Agency. Although the structure of the British Columbia egg industry is likely to be different than the British Columbia broiler industry, and even further dissimilar to the Alberta broiler industry, their analysis of supply elasticity hold important

insights for the conduct of this study.

> "The supply elasticity offered by R.M.A. Loyns and W.F. Lu[68] for Canada of +1.0 seems too low to us. ..... With labour and land being a trivial portion of costs, and with capital, laying hens, and feed mash virtually in perfectly elastic supply, only "expertise" can be the scarce, supply price raising factor. Discussion with those in the industry in academic positions, government, and business convinces us that "expertise" is in highly elastic supply. Therefore (supply elasticity) is probably no different from (positive infinity). ....."[69]

Borcherding and Dorosh further support this argument in a note:

> "Agricultural economists point out that one pitfall in estimating (supply elasticity) is concentrating on existing farm units, as is typical in cross-section data, instead of on output behaviour allowing for entry and exit. Also for the long run, input prices change sufficiently, as does technology, so insensitivity of output product to price changes may involve serious specification problems. Common sense clearly indicates (supply elasticity) exceeds +1.0."[70]

Veeman (1982) compared the quota-constrained Canadian egg and poultry industries to a calculated equilibrium value if the industries had been unconstrained. (United States data are used for reference and comparison.) She notes the heavy dependence of the results upon the assumptions made and the estimation procedure used. In conclusion of her article, and a further supporting article, (Veeman (1982a)) she notes significant benefits of supply restricting programs accruing through producer prices, incomes, and capital gains, primarily at consumer expense and due to reduced consumption levels. While admitting that the actual values of the costs to consumers are subject to debate, she maintains they are "substantial".

The research report conducted by Arcus (1981) calculates social costs of regulation in the Canadian broiler and egg industries. His calculations were based entirely on quota values. By examining quota values in "trading" provinces, and using square footage allowances per bird per cycle, Arcus derived estimates for quota values in "non-trading" provinces as well. He argues that as quotas are uniquely determined in Canada they reflect the true "Canadian" valuation of present and future benefits of the existence of quota. While few would dispute that quota values are determined by Canadian factors, it is repeatedly noted in the literature that quota values alone will underestimate the social costs or transfers of benefits within an industry or economy.[71]

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[68] Loyns, R.M.A., W.F. Lu, 1972, "Characteristics of Demand for Eggs in Canada: An Analysis of Cross Section and Time Series Data", Department of Agricultural Economics, University of Manitoba, Winnipeg.
[69] Borcherding and Dorosh (1981) p. 37.
[70] Borcherding and Dorosh (1981) p. 80,81.
[71] A more complete discussion of social cost is found in Appendix A.

B. Derivation of Farm Level Demand Relationships

The relationship between prices at various marketing levels is known as a marketing margin or spread. Rhodes (1978) stated that "a marketing spread is a price for a marketing service".[72] A marketing margin can be defined as the difference between the retail price and the farm value of a product. In attempting to describe farm level phenomena, it is therefore necessary to remove these marketing services from the retail data.

Rhodes also noted that "the long term general relationship of farm price and marketing spread for a particular product is likely to be reasonably stable".[73] Rhodes does not however, quantify the long run.

The poultry industry has undergone some major structural and institutional changes in the past. It is far more integrated and concentrated than it was perhaps fifteen years ago. Thus within a time period of fifteen years there would be more than a 'simple' relationship of marketing services that would be inherent in the observed price spreads.

Marketing conditions would be subject to short term fluctuations in periods of only one or two years.

A period of five years was chosen for this study in an attempt to avoid complications of the period of study being either to short or too long. Availability of consistent data was another consideration.

There are different ways that marketing margins are established. For example, there is cost-plus pricing, average cost pricing flexible market method, experimental or research pricing. These methods are known as complete pricing methods. There are incomplete pricing methods such as price followership (i.e. prices charged by followers are in some way dependent on a price charged by a leader). Margins have also been classified in another manner: systematic (fixed absolute or percentage) and non systematic (price leadership or short run profit maximization).[74]

Although the actual mechanism for establishing marketing margins is not in itself an important factor, it has an important effect on the results of this study. In Alberta there exists a situation of a single price leader with price followership. It is not known, nor

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[72] Rhodes (1978) p. 111.
[73] Rhodes (1978) p. 111.
[74] For a complete discussion of these various methods see George and King, 1971, pp.55-61.

does it need be known, how the price leader in Alberta establishes its price levels. What it does mean is that there is a followed minimum price of retail broiler chicken in Alberta. This minimum price is effective because the price followers do not have sufficient individual market share to exert any influence on price.

Broiler chicken is not a commodity used in Alberta to draw large numbers of consumers into the store, therefore its' prices are not so volatile as those observed for pork or beef. There are considerably fewer "cuts" of broiler chicken and therefore the retail pricing of chicken is more closely related to the original whole carcass pricing system at the farm level than pork or beef.

The implications of this situation is that there is a minimum price for broiler chicken that is followed fairly closely by all smaller retailers. Although there may be fluctuations (and these fluctuations may be substantially higher in the case of convenience stores for example), the marketing margin will be no less than the prices used in this study.

The retail prices used in this study are minimum monthly prices for broiler chicken in the major food chains in Alberta. They are quoted for Grade A, Whole frozen chicken.[75] The monthly farm prices used in this study are those set by the Alberta Broiler Growers Marketing Board. These prices are set f.o.b. plant.[76] The data set spans January 1978 to December 1982. The time variable was entered as a simple trend with January 1978 = 1. Due to lack of indices available for recent months, especially for producer prices, this method was chosen as an alternative.

Producer prices are set by the Alberta Broiler Growers Marketing Board according to a number of factors, however one major influencing factor is retail demand.

George and King (1971) present a method for determining the elasticity of price transmission. This is defined as the ratio of relative change in retail price to the relative change in the farm price. However, in the George and King analysis, farm price is the independent variable because they are analyzing U.S. data, where, as mentioned previously, the industry structure is highly integrated. Canadian markets are dominated by producer controlled marketing boards, where the price setting procedure is a partial response to retail demand characteristics. Therefore in the Canadian industry, farm price is the

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[75] Frozen chicken is moved in larger quantity in Alberta, and is less perishable therefore is expected to follow a more stable pricing pattern.
[76] I.E. the producer must pay the cost of transportation.

dependent variable.

The concept of elasticity is a ratio of relative change in two variables. It is the percentage change in a dependent variable associated with a 1% change in another variable. In the case of this analysis, the elasticity of price transmission is being derived. In context, this would be the percentage change in farm price relative to a percentage change in retail price.

Koutsoyiannis (1981) outlined how the average elasticity can be derived from the slope of the regression line at the means of the observations:

$$Ep = \frac{dY / Y}{dX / X}$$

$$Ep = \frac{dY}{dX} \cdot \frac{X}{Y}$$

where Ep is price elasticity, Y is quantity demanded or supplied, and X is price.[77]

The estimated coefficient of the linear regression line provides dy/dx. Using means of the variables X and Y the average elasticity can be calculated.

$$Ep = b \cdot \frac{\bar{X}}{\bar{Y}}$$

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[77] Koutsoyiannis (1981) p. 66.

Using this information, the elasticity of price transmission from the linear equation (Equation 1) would be:

$$Ep = \frac{\text{d Farm Price}}{\text{d Retail Price}} \cdot \frac{\text{Ave. Retail Price}}{\text{Ave. Farm Price}}$$

$$Ep = +.1399 \cdot \frac{.9300}{.4477}$$

$$Ep = +.278330$$

Producer and retail prices were entered into Equation 2 as logarithms. (As noted earlier, this permits the direct interpretation of the estimated coefficients as elasticities.) Equation 2 yielded a model with a slightly closer fit than the simple linear model. The elasticity of price transmission was similar between the two equations: +.27735 from the logarithmic equation, +.27833 from the linear equation. For use in further calculations the logarithmic derivation is preferred as the model was slightly better fitting.

The elasticity of price transmission calculated here is of the same sign and magnitude as that obtained by George and King (1971). (Their estimate based on U.S.A. data was +0.7749.) The estimate obtained in this study is slightly lower than the U.S. figure. As the Canadian market is characterized by supply control, it is to be expected that the price transmission would be less elastic than that observed in the United States where the industry is comprised of more fully integrated firms. Market fluctuations in the U.S. are reflected in price fluctuations. Market fluctuations in Canada are more readily reflected in fluctuations in storage levels.

It has been previously noted that the retail elasticity of demand at the farm level is the product of the elasticity of price transmission and the elasticity of demand at the retail level. This can be seen in the following derivation of the slope of the supply curve.

Regression Equations: Producer - Retail Price Spread

Equation 1.

Method	Coefficient	B	Std. Error	Calc."t"
Linear	Constant	.26095	.01747	14.94
	Time	.00204	.00015	13.52
	Retail P.	.13399	.02178	6.51

R^2 = .9198
Model and coefficients significant at 1% level.

Equation 2.

Method	Coefficient	B	Std. Error	Calc."t"
Log.	Constant	-.92785	.01329	-69.82
	Time	+.00460	.00032	14.19
	Retail P.	+.27735	.04443	6.24

R^2 = .9273
Model and coefficients significant at 1% level.

By Definition:

$$1)\quad E_R = \frac{\frac{dP_R}{P_R}}{\frac{dQ}{Q}} \qquad \text{and} \qquad 2)\quad E_F = \frac{\frac{dP_F}{P_F}}{\frac{dQ}{Q}}$$

Where:

E_R = Elasticity at retail level

P_R = Price at retail level

Q = Quantity

E_F = Elasticity at farm level

P_F = Price at farm level

As farms are supplying product to be consumed, it is assumed that $\frac{dQ}{Q}$ is equal in Equations 1) and 2).

from 1) $\frac{dQ}{Q} = \frac{\frac{dP_R}{P_R}}{E_R}$ and from 2) $\frac{dQ}{Q} = \frac{\frac{dP_F}{P_F}}{E_F}$

thus:

$$\frac{\frac{dP_R}{P_R}}{E_R} = \frac{\frac{dP_F}{P_F}}{E_F}$$

therefore:

$$3) \quad E_F = \frac{\frac{dP_F}{P_F}}{\frac{dP_R}{P_R}} \times E_R$$

note that 3) is the same as:

$$3a) \quad E_F = E_{PT} \times E_R$$

where: E_{PT} = Elasticity of price transmission

from 3a)

$$\frac{dP_F}{dQ} \times \frac{Q}{P_F} = E_{PT} \times E_R$$

thus:

$$4) \quad \frac{dP_F}{dQ} = \frac{E_{PT} \times E_R \times P_F}{Q}$$

where Equation 4 is the slope of the farm level demand schedule.

C. Development of Alternative Scenarios

Supply management schemes for agricultural products are observed for many commodities in Canada. Wherever a national scheme prevails, individual provinces may experience some difficulties in adapting to the overall plan. Some of the more recent studies of provincial / federal situations are outlined and discussed here.

Ontario Ministry of Agriculture and Food (1979) conducted an analysis of benefits and costs to Ontario of participating in the national supply management program for industrial milk. The study evaluated the program as it currently affected Ontario, proposed and evaluated changes in the existing program, and evaluated effects of Ontario's withdrawal from the program. Results of the study indicated that net returns for all concerned[78] would be maximized with a change in the federal pricing system rather than Ontario's withdrawal from the national scheme. They stated that "implementation of changes at the provincial level typically have much less impact for the province than corresponding changes at the federal level have for the province".[79]

Grosh *et. al.* (1978) conducted a study on the implications for the Alberta turkey industry of remaining in or withdrawing from the national marketing scheme. The study was initiated because Alberta had reversed from being a net exporter to becoming a net importer of turkey meat. Based on the share formula in place, Alberta was expected to become less and less self-sufficient over time. By opting out of the national scheme, and assuming no imports of turkey meat, Alberta would gain an extra 5 million pounds annual production by 1985 thereby allowing an additional 10 producers into the industry. However, in making this projection it was assumed that Alberta would increase market penetration into other areas if it was independent. Alberta chose to remain in the national plan even though the results of the study indicated that new producers were not expected to be admitted until 1985. Remaining in the national plan offered a more stable economic and political climate.[80]

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[78] (Producers, Consumers, Processors, and Taxpayers in Canada and Ontario.)
[79] Ontario Ministry of Agriculture and Food, 1979, p. xxvi.
[80] One concern expressed in the study was that withdrawal from the Canadian Turkey Marketing Agency would create political repercussions with other commodities. Also, if "dumping" should occur, the province could be asked to support local producers at the expense of the political climate with other provinces. If the stability of the national scheme was in itself jeopardized by the withdrawal of Alberta and/or other provinces, the U.S. imports could not be adequately dealt with.

The Canadian Turkey Marketing Agency attempted to accomodate Alberta concerns and allotted a larger share of overbase quota to Alberta producers. However, in 1983, the Canadian Turkey Marketing Agency reduced total national quota by approximately 2 million kgs. This meant a reduction of 455 thousand kgs. for Alberta producers. (Overbase allocation is withdrawn in the same proportion as it is allotted – as Alberta was given a disproportionate share it must also absorb the majority of the decrease back to base quota.) Alberta turkey producers are reduced to 8.3% of national quota. Nova Scotia has also voiced disapproval of the Canadian Turkey Marketing Agency's quota allocation and served notice of withdrawal for 1984.

A major concern of each poultry industry in Canada controlled by national plans is that provincial quota allocations match growth in provincial population and consumption. Growth in population and growth in quota allocation have been a special issue in faster growing provinces in Canada, especially in Alberta and British Columbia. Alberta's population increase per 1000 people was 44.2 in 1981 (compared to a national average of 11.8) and 34.8 in 1982 (Canada: 10.7). This was the highest rate observed in Canada.[81] A high rate of increase was also observed in British Columbia: 29.3 in 1981, and 14.2 in 1982. Within these growth components, the rate of natural increase in both provinces was constant between years, however migration into these provinces slowed considerably. Migration in Alberta decreased from 32 to 22 per 1000, and, 22 down to 6 per 1000 for British Columbia. As a result, the allocation rate of national quota increases to Alberta and British Columbia have not matched population growth.

Due to this growing shortfall in the egg industry,[82] Canadian Egg Marketing Agency introduced a new quota allocation policy in 1981. A study by Appleby (1982) indicated that the change in the quota allocation policy would result in a 7% decline in eggs "imported" into Alberta by 1991. The Canadian Egg Marketing Agency is currently negotiating an overbase allocation plan with little apparent success. (Issues such as provincial self–sufficiency and comparative advantage are strongly debated.)

The broiler industry in Alberta has remained unique in that it has never been a signatory to the national agency. Therefore, Alberta has been able to enjoy an increase in

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[81] Alberta's population was 9.4% of the Canadian total in 1982.
[82] (Consumption (population) increases of 3.2% as compared to Quota increases of 1.3% per annum between 1976 and 1978.)

production to meet the increasing demand arising from population increase. Whereas the egg and turkey industries in Alberta have been increasingly serviced by other provinces, the broiler industry has not. In fact, Alberta has maintained interprovincial broiler markets.

As outlined in Chapter 3, the intent and scope of the national marketing institution is to regulate all interprovincial movement of broiler chicken. It is clear that the powers of the legislation have not been enforced in the past. However, it is possible that the situation may be altered in the future. The operating environment of the Alberta broiler industry would be altered completely. The following sections outline the alternative scenarios likely to result.

Range of Farm Prices

The farm prices used in this study were the minimum monthly producer prices set by the Alberta Broiler Growers Marketing Board.[83] The average producer price did not vary greatly between 1981 and 1982. (50.375¢ per pound liveweight in 1981 and 50.27¢ in 1982).[84] However, the range of prices in 1982 was important. In January of 1982 the producer prices were at their highest level (51.50¢) but in December the minimum price had dropped to 46.14¢ per pound liveweight in response to market conditions.[85] Calculations in this study used the range of 1982 prices as well as the average price. A discussion of the most likely changes in price is included in chapter 7.

Cost of Production

Cost of production figures for the entire broiler industry in Alberta are not available. The Poultry Branch, Alberta Agriculture, calculates cost of production based on individual marketing cycles from a small survey of cooperating farms. Some of these data were used in the following analysis.

A total of 14 different production cycles marketed between September 1980 and September 1982 were compared. These varied from 12,000 to 46,000 birds marketed. Costs were analyzed in two categories: variable costs per cycle and fixed costs (those which did not vary according to the size of cycle being considered.)

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[83] Premiums over minimum prices in 1983 were aproximately 6.5¢ per kg.
[84] (110.83¢ per kg. in 1981, 110.59¢ per kg in 1982.)
[85] (113.30¢ per kg. in January, 101.51¢ per kg. in December.)

Variable Costs per Cycle

Variable costs can be divided into three main components in broiler production: Feed, Chick, and other. Both feed and chick costs are relatively equal for all producers regardless of size.[86] As a result, one measure of the operators managerial ability is return over feed and chick per pound (liveweight) marketed. Other variable costs per cycle included litter, medicants & vaccinations, brooding & electricity, and cartage & loading labour.

Feed and chicks constitute the major costs of broiler production. In the small sample of farms, feed cost was an average of 26.7¢ per pound marketed[87], chick cost was 8.8¢ per pound[88] – this subtotal of 35.5¢[89] in relation to minimum average total cost of 45.2¢.[90]

Feed conversion is the most important factor in determining cost of production as feed cost is the major component. In analyzing the farm sample it was noted that feed conversion improves with earlier marketings.[91] Similarly, return over feed and chick improves with the better feed conversion of earlier marketing. Considering the biological limitations of production and feed conversion, this observation is redundant. It is a management decision, date of marketing which has greatest effect on feed costs per pound of bird marketed.

The "other" variable costs did not follow any observable pattern in this small sample of farms. Neither feed conversion nor return over feed and chick follow farm size.

Fixed Costs per Cycle

Due to the small sample size, the fixed costs could not be examined too closely. These included depreciation and interest costs, labour, insurance, taxes and

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[86] There are some discounts for higher volume of feed sales and chick placements but, as discussed later, the small average size of broiler farm in Alberta render little savings in this respect. The chick prices quoted are usually in lots of 10,000 birds. The largest feed cost saving is the difference between small bag (e.g. 50kg.) and truckload quantities. As all commercial producers would be using truckload quantities, feed prices would be relatively even for all producers.

[87] (A feed cost of 58.85¢ per kg.)

[88] (A chick cost of 19.36¢ per kg.)

[89] (A variable cost of 78.1¢ per kg.)

[90] (A total cost of 99.4¢ per kg. marketed.)

[91] Feed conversion decreases at the end of the growing period. Birds that are kept too long will not gain a large amount of weight but will continue to eat a large volume of feed.

board levies.[92]

Net revenue (total revenue minus total costs) followed the return over feed and chick with one exception: those farms with high interest and depreciation costs. There were only three farms of this nature. Their fixed costs per pound marketed were fully 5¢ higher[93] than the observed range through the rest of the sample. These three farms were excluded from the fixed cost calculations. (This issue is discussed later along with economies of scale.) The highest and lowest fixed costs were included in the cost of production estimation, the average assumed to fall somewhere in between.

Table 6-1 indicates the estimated average cost of production for farms of this size range.

The average size of broiler farm in Alberta is fairly small.[94] From the 1983 Alberta Broiler Growers Marketing Board quota list the average quota size allotted is approximately 23,500 square feet. (As Alberta's quota regulations are 1 bird per square foot this would indicate a 100% quota cycle size of 23,500 birds.[95]

From the farm survey it was noted that the average number of birds marketed was 20,086.6 with an average livability of 93.94%. This would mean an average of 21,382 birds placed per cycle. From the above paragraph, the 100% quota cycle size was 23,500 birds. The difference between the farm survey and "average" quota size is only 2,118 birds. As the distribution of farm sizes in Alberta is so heavily "small - weighted", and as the average farm size in the sample was slightly smaller than the "true average" size, it was assumed that these farms probably represented a fairly well-managed average size farm in Alberta.

It is still likely that average cost of production is underestimated for the very small farm sizes (3000 to 10,000 square feet of quota for example), as well as for those farms recently purchased which would likely have a large debt to service as well as regular production costs.

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[92] Board levies are based on size of flock marketed but there was no means of separating these data out of the "other" category. A range of observed fixed costs was included in the sensitivity analysis.

[93] (11¢ per kg. higher)

[94] See discussion on economies of scale (Section D, this chapter, page 72).

[95]) Average quota marketings vary between 100 and 120% in recent years therefore this estimate may be smaller than actully placed.

Table 6-1: Broiler Cost of Production in Alberta (1980-1982)

Cost	Liveweight ¢/Lb.	¢/Kg.
Ave. Feed	26.75	58.85
Ave. Chick	8.80	19.36
Other	3.37	7.41
Total Variable	38.92	85.62
Fixed Range	6.28-8.08	13.82-17.78
Total Costs	45-47	99.0-103.40

Source: Alberta Agriculture, Confidential Survey

Estimated Production Levels

Production of chicken in Alberta has changed in recent months. Whereas in 1980 - 1982 Alberta produced a fairly substantial amount of roaster and cornish weight chicken, these permits have been substantially cutback in 1983.[96] Therefore published production figures which have been used for estimation purposes are those for broiler weight chicken only. Further to this, the Alberta Broiler Growers Marketing Board has increased the quota allotment for Alberta in 1983. The Alberta Broiler Growers Marketing Board appears to anticipate an increase in production over 1982 levels even though roaster and cornish weight chicken has been significantly reduced.

Figures available in published sources are slightly different from those utilized by the Alberta Broiler Growers Marketing Board. Part of the reason for this is a difference in the data base itself. The figures published in the Poultry Situation and Outlook are annual or quarterly, and, are obtained through Agriculture Canada Market Information Service. The figures available from the Alberta Broiler Growers Marketing Board are calculated weekly. The summation of weekly data does not always end on December 31 but may perhaps end earlier or later each year depending upon the week ending date. In other instances where the Alberta Broiler Growers Marketing Board indicated annual production

[96] Cornish production for 1983 is estimated to be only 55% of 1982 levls, roaster production only 76%.

figures, these were also utilized in estimating future production levels. (See Table 2-2.)

As the published data are consistent, these were used as one base for calculating estimates of production levels. The data are presented in millions of kilograms eviscerated weight. As this study is conducted at the farm level, these data were converted to liveweight using the Agriculture Canada conversion factor of 73.5%.

The quota increase in 1983 is much more difficult to deal with. The following assumptions were made:

a. most of the extra production will be broiler weight chicken,

b. the extra quota is issued at 100%,

c. a 9 week production cycle yielding birds of an average 3.75 pounds liveweight.

These assumptions yielded an estimated 5,559,000 pounds of product over and above 1982 levels. (Error in estimating production levels is indicated in the sensitivity analysis.)

The exclusion of Alberta from the interprovincial markets in no way limits access to the international market. Alberta could still produce at current or higher levels of production and export the product internationally. This is unlikely to take place in the near future. Stable export markets are slow to develop, and are characteristically unstable in the meantime. In the short term it is not likely that Alberta producers would willingly submit to an unguaranteed situation where the product which could not be sold internationally would destabilize the local constricted market.

Another reason Alberta is not likely to develop international markets is that if they cannot compete with other Canadian provinces, it is not likely they will be able to effectively compete on the world market. Studies in Manitoba conducted on exports to Japan indicated that the Canadian product was of a preferred quality to that produced in the United States. There was an apparent willingness to pay up to 15% over world price for this Canadian chicken. The Japanese do not buy large quantities of Canadian chicken because the price is 25 to 30% higher than world market prices.[97]

Another alternative is the further market development in the fast food industry. The McDonalds food chain has observed that the "McChicken" was met with least success in Quebec (where per capita chicken consumption was the highest in Canada) and met with the most success in Alberta (where chicken consumption is historically lowest in Canada).

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[97] *Canada Poultryman*, Vol. 70(4):26.

However, some reservation has been exhibited by the McDonalds chain in further developing chicken products. In 1981, the chain chose not to introduce a product called "McNuggets" (a plate of breaded chicken) even though it was doing well in the United States. Basing their calculations on Canadian chicken prices, they estimated the product would have to be marketed at $2.29, a price they considered too high for the consumer catered to.[98,99]

It is not likely that Alberta will develop export markets for chicken in the near future.

Estimating National Quota Offered to Alberta

The Canadian chicken market situation is currently in a "soft" state. It is by high storage stocks levels which exert depressing effect on producer and wholesale prices. It is also complicated by the inability of the national agency to maintain production levels at or below target levels due to illegal or excess production.

The minimum offering that would probably be suggested is the 7.79% of national quota currently allotted to Alberta (even though there is no current legal agreement to produce that amount.) The maximum offering is a political decision as members of the agency divide the national quota among producing provinces.

Alberta was offered 8.6% of national production in 1979 when the Canadian Chicken Marketing Agency initially allocated quota among the provinces. It is possible that the national agency might offer a larger percentage share of the quota if an agreement was reached. Alberta's participation would reduce overproduction problems currently faced by the Canadian Chicken Marketing Agency. National allocations of 8 and 9% were also considered in the sensitivity analysis.[100]

As the national market is in a current surplus, it is possible that the national quota may be reduced from current 1983 levels. The sensitivity analysis includes calculations of a reduction in the total Canadian quota even if Alberta participates in the national

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[98] *Canada Poultryman*, Vol. 68(11):16.
[99] The McDonald's chain also made an unsuccessful attempt to negotiate a lower-priced supply agreement that would permit introduction of this product into Canada in 1984.
[100] A temporary agreement between the Canadian Chicken Marketing Agency and the Alberta Broiler Growers Marketing Board was reached in June 1983. The quota allottment to Alberta was 9.4% of the national total. The terms of a possible aggreement starting January 1, 1984 have not yet been reached although negotiations have been initiated. Further discussion of this agreement is found in Chapter 7, page 76.

programme.

Estimation of Interprovincial Marketings

The estimation of Alberta's interprovincial marketings is based on knowledge of past marketings (1968-1970) from Alberta, and on knowledge of the "import" situation in British Columbia.

In a study done by Copeland (1974), it was calculated that the marketing of broiler chicken produced in Alberta serviced the "local" market (86%), British Columbia with approximately 12% and other regions in Canada with approximately 2% for the period of 1968-1970. There is little indication that this directional distribution of Alberta product has altered much since that time. Using these percentages and production levels outlined in the previous section, estimates of product shipped interprovincially were obtained. A cross-check of the above estimates was derived from the British Columbia perspective.

British Columbia was 74% self-sufficient in chicken consumption in 1977. Knowing the production and international imports for 1977, it was calculated what the difference between self-sufficiency and consumption would have been.

Reported chicken slaughter for British Columbia was 61,227,000 pounds eviscerated weight in 1977. Approximately 56,000 pounds of product was imported from the United States in that same year. A self-sufficiency level of 74% would indicate that an additional 20,353,000 pounds of chicken were moved into British Columbia from other parts of Canada.

Not all of the product shipped into British Columbia can be assumed to come from Alberta. However, since the East Kootenays and North-Eastern British Columbia was at the time, (and still is), serviced almost entirely with Alberta product, one might assume that at least half of the product moving into British Columbia was from Alberta.[101]

Examination of the transportation cost matrix from Holliday (1976) in Appendix B suggests that as Alberta has an advantage over the rest of Canada in shipping costs.

If it is assumed that British Columbia increased self-sufficiency to 80% since 1977[102]

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[101] (At least 10 million pounds eviscerated weight in 1977.)

[102] This is doubtfull as British Columbia has participated in the Canadian Chicken Marketing Agency since 1979 and therefore would not have been able to meet increasing population growth demand from increases in national quota. (See earlier discussion on population

Alberta continues to service "traditional" markets in North-Eastern B.C. and the East Kootenays. It is still reasonable to assume that Alberta supplies at least one half of British Columbia's gap between production and self-sufficiency. This implies at least 9 million pounds eviscerated weight shipped into British Columbia in 1982 even if B.C. increased self-sufficiency level to 80%. As this level is somewhat doubtful, in all likelihood the product being shipped into British Columbia from Alberta is greater than 9 million pounds eviscerated weight per year. A minimum of 10 million pounds or 6.18 million kilograms was used in the calculations for this study.

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[102](cont'd)growth and national quota increases.) However, British Columbia did open a new processing plant in the interior of B.C. at Armstrong in 1980. This plant was intended to service the Kamloops - Okanagan market areas. It was not expected that this plant might fill the "traditional" markets for Alberta product for quite some time as there are very few producers located in the interior.

D. Economies of Scale

Economies of scale are one of the most debated issues in producer controlled marketing situations. One major aim of supply management is to preserve the nature of the small family farm industry to the exclusion of vertical integration and large scale farms.

There are few broiler farms in Alberta which produce the maximum number of birds allowed by the Alberta Broiler Growers Marketing Board. A large number of producers are only part-time broiler farmers, drawing significant income from other sources (often agricultural). The purpose of this section is to estimate producer gains that could accrue if the average farm size in Alberta was to increase and approach that limit.

A study conducted on the British Columbia broiler industry in 1977 indicated that reductions in average total costs on larger size farms were significant. (The study examined farms ranging from 8,000 to 100,000 birds shipped per cycle.) Thorough analysis of the results of their study indicated the cost savings were not made in variable costs but primarily in more efficient utilization of capital assets and productive capacity.[103]

When the size distribution of broiler farms in Alberta is observed, it is noted that the distribution is heavily skewed by the smaller farm size. (Refer to Table 7-7.) Part of this is due to Alberta Broiler Growers Marketing Board policy. In order to ensure new entrants to the industry, the board allots 35% of any quota increase to new growers, usually in small quantities. The board also has a small plant (less than 5000 square feet quota) policy for regions in Alberta which do not have a large market to service. The end result is a large number of small farms which do not approach the 3% limit of provincial production (which at current levels is approximately 118,000 square feet).

The study in British Columbia indicated that a saving of 1.6¢ per pound could be made for every increase of 100,000 pounds per cycle. A standard deviation of 0.7¢ was observed around that estimate.

From the results of the small Alberta sample, the relationship above was estimated at the average size and cost of production in the sample. The observed standard deviation was used in the sensitivity analysis.

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[103] **Broiler Production 1977**

VII. Results and Discussion

A. Implied Cutbacks in Production of Broiler Chicken in Alberta

The estimation of production cutbacks is heavily dependent upon the assumptions made. Production of chicken in Alberta will not continue in a similar pattern to that observed in 1983 because the majority of cornish and roaster permits have been withdrawn from producers. Apart from this however, is an increase in quota license for the province of Alberta. Clearly it is hoped by the Alberta Broiler Growers Marketing Board that there will be a continued increase in demand as has been observed for the past few years. What is not clear is how quickly that market increase will be occurring.[104]

Another aspect of the expected increase in poultry demand is relative to the consumption of beef and pork. As noted earlier in the literature review, these commodities are substitutes for chicken.[105] Safeway officials suggest that consumption of poultry may in fact overtake the consumption of beef in the next five years. Whereas chicken used to be 85% of beef price[106], it has now dropped to 30% of beef prices on average. Chicken has the added advantage of being lean quality meat with lower cholesterol, increasing its' appeal to nutrition-conscious consumers.[107]

Estimates of future production levels are slightly higher using annual data from the Alberta Broiler Growers Marketing Board (107 million pounds) as compared to the estimate using published data (102 million pounds). The 107 million figure is preferable, as it's source is the locus of decision making. Another reason is that there are no means to convert published data on production of chicken other than broilers when the percentage production of these types of chicken in future is not known. However, it does provide support in that the two estimates are fairly similar. (Refer to Table 7-1.)

Estimation of the quota likely to be allocated to Alberta by the Canadian Chicken Marketing Agency is at best only an estimate. Although the agency has established criteria to determine quota allocations it is not apparent that these criteria are adhered to. Internal

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[104] Alberta and British Columbia experienced a large in migration of people, but not necessarily a large natural rate of increase. As was noted in the previous chapter, population growth in the faster growing provinces has slowed considerably in the past two or three years.

[105] See Appendix C for per capita consumption of meat and poultry in Canada.

[106] (presumably whole carcass price)

[107] J. Morris, V.P. Safeway, *Canada Poultryman*, Vol 70(1):11.

Table 7-1: Implied Cutbacks in 1983 Alberta Chicken Production

('000 Pounds Liveweight)

Alberta Participates in the Canadian Chicken Marketing Agency

A) National Quota Remains at 1983 Level.

Alberta Allocation (%)	Alberta Allocation (Pounds)	Alberta Expected Production	Implied Cutback (Pounds)
7.79	87,075	102,179	15,104
8.00	89,432	"	12,747
9.00	100,611	"	1,568
7.79	87,075	107,378	20,303
8.00	89,432	"	17,946
9.00	100,611	"	6,767

B) National Quota Reduced 1%

Alberta Allocation (%)	Alberta Allocation (Pounds)	Alberta Expected Production	Implied Cutback (Pounds)
7.79	86,213	102,179	15,966
8.00	88,537	"	13,642
7.79	86,213	107,378	21,165
8.00	88,537	"	18,841

C) National Quota Reduced 2%.

Alberta Allocation (%)	Alberta Allocation (Pounds)	Alberta Expected Production	Implied Cutback (Pounds)
7.79	85,342	102,179	16,837
8.00	87,643	"	14,536
7.79	85,342	107,378	22,036
8.00	87,643	"	19,735

Alberta Remains Independent of the Canadian Chicken Marketing Agency.

Alberta Allocation (%)	Alberta Allocation (Pounds)	Alberta Expected Production	Implied Cutback (Pounds)
		102,179	10,000
		"	15,000
		107,378	10,000
		"	15,000

pressures from various participating members have in the past brought about changes in distribution of quota from year to year.

Discussion and speculation about policies of the Canadian Chicken Marketing Agency comprise a large entry in *Canada Poultryman*, a nationwide monthly publication. One suggestion is that if the Canadian Chicken Marketing Agency were better able to manage the Canadian market then Alberta might be more inclined to participate. Another suggestion is that if Alberta were to participate and produce according to its' allocation, then the Canadian Chicken Marketing Agency would be better able to manage the situation.[108] The "overproduction" in Alberta is not as serious as it might be because the Alberta board is well managed and produces fairly close to target levels.[109]

The range of estimated quotas allotted to Alberta presented in this analysis cover the alternative situations that are likely to arise. If Alberta were assigned 9% of national quota for example, it would only experience a reduction in production of about 6.7 million pounds liveweight. This figure is only slightly more than the estimated increase in production due to the 1983 quota increase. A reduction of this relatively small amount of production would likely be the best result of a national offer to the Alberta industry. An allocation of 9% of national quota would be nearly in line with Alberta's 9.4% of Canadian population (in 1982).

On the other hand, if the Canadian Chicken Marketing Agency holds firmly to the 7.79% of national quota currently being allocated, Alberta would experience a cutback of more than 20 million pounds liveweight. In a situation such as this, the loss of the interprovincial markets estimated at 10 to 15 million pounds would yield lesser contractionary effects.

As discussed in chapter 2, the Canadian Chicken Marketing Agency is experiencing difficulty in preventing overproduction. Illegal and unregulated productionin 1982 was estimated between 9 and 27 million kgs. (20 to 60 million lbs.). Also during 1982, there was a net 8.3 million kgs. (18 million lbs.) of unexpected product from participating provinces. It is therefore assumed that any traditional markets withdrawn from the Alberta Broiler Growers Marketing Board would be readily serviced from other Canadian sources.

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[108] *Canada Poultryman, various issues.*
[109] Industry sources, personal communication.

The Alberta Broiler Growers Marketing Board and the Canadian Chicken Marketing Agency reached a temporary agreement in June 1983. Alberta will reduce production levels in 1983 to 78 million pounds eviscerated weight (106.1 million pounds liveweight) and the national agency will take this figure as their annual allotment to Alberta. This implies a 4 million pound reduction (eviscerated weight) from production levels expected for 1983 by the Alberta Broiler Growers Marketing Board.[110] In addition Alberta has agreed to pay levies to the national agency for the last six months of 1983 but the province has not been extended voting priveleges in the national agency.

This particular quota allotment is approximately 9.42% of the national production quota for 1983 which is the same as the Alberta percentage of total Canadian population. Alberta has the opportunity to join the national agency as a full member on January 1, 1984. The conditions of the Alberta entry have not been stated, and it is not guaranteed that the conditions of the interim agreement would be maintained after Alberta had agreed to participate fully. If future national allotments to Alberta do not correspond with the growth expected in the Alberta market the Alberta producers will again have to weigh the alternative consequences of participation or independence.

The smaller the production change, the smaller the effect on Alberta producers. Table 7-2 indicates the change in producer surplus associated with an increase or decrease in production. The complete range of both price and cost of production is presented for comparison.

It may be argued that the prices cannot be assumed at the 1982 average when the Alberta producers are currently experiencing lower prices than the 1980 to 1982 averages. Likewise the "soft" national market does not appear to hold higher prices for broiler producers in the near future. It can also be argued that the cost of production figures assumed do not accurately reflect on all producers in Alberta seeing as the sample size was small. While both of these criticisms may in fact be true, the analysis presented here is with regards to the **change** in producer surplus that might be experienced in alternative situations. As such, it does not represent total benefits that producers may or may not be receiving. Estimation of inappropriate prices and costs may impart a bias, but as that bias is carried throughout the analysis, the estimates of the change alone will still be

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[110] (Approximately 5.4 million pounds liveweight.)

Table 7-2: Change in Producer Surplus Associated with 1000 Lb. Change in Production (1983).

$ Per 1000 Pound Change In Production

C.O.P.	Farm Price	Farm Price	Farm Price
¢/lb.	¢/lb.	¢/lb.	¢/lb.
	50.27	46.14	51.50
46	42.70	1.40	55.00
45	52.70	11.40	65.00
47	32.70	-8.60	45.00

$ Per 1000 Kilogram Change In Production

C.O.P.	Farm Price	Farm Price	Farm Price
¢/kg.	¢/kg.	¢/kg.	¢/kg.
	110.59	101.51	113.30
101.20	93.94	3.08	121.00
99.00	115.94	25.08	143.00
103.40	71.94	-19.82	99.00

* Note: Canadian Chicken Marketing Agency levy is $9.00 per 1000 pounds or $19.84 per 1000 kilograms.

reasonable.

Using the average price and cost of production, Table 7-3 denotes the implied losses. The $42.70 per 1000 pound change in production was applied to the cutbacks estimated in Table 7-1. If the lower producer price had been used, the total loss figures would all be reduced to approximately one quarter of those indicated. However, the relative costs would not have changed.

The apparent losses indicated in Table 7-3 are substantial. Producers would be forfeiting a surplus as well as being forced to pay the levy applied by the Canadian Chicken Marketing Agency on regulated product. The reduced surplus associated with a restriction to provincial boundaries does not appear large when compared to participation in the Canadian Chicken Marketing Agency.

Table 7-3: Implied Losses to Alberta Producers (1983).

Alberta Participates in the Canadian Chicken Marketing Agency

A) National Quota Remains at 1983 Level.

% of National Quota	Pounds Production Cutback	$ Lost Surplus	$ CCMA Levy	$ Total Loss
7.79	20,303	866,938	966,402	1,833,340
8.00	17,946	766,294	"	1,732,696
9.00	6,767	288,951	"	1,255,353
7.79	15,104	644,941	919,611	1,564,552
8.00	12,747	544,297	"	1,463,908
9.00	1,568	66,954	"	986,565

B) National Quota Reduced 1%.

% of National Quota	Pounds Production Cutback	$ Lost Surplus	$ CCMA Levy	$ Total Loss
7.79	22,036	940,937	966,402	1,907,339
8.00	19,735	842,685	"	1,809,087
7.79	16,837	718,940	919,611	1,638,551
8.00	14,536	620,687	"	1,540,298

Alberta Remains Independent of the Canadian Chicken Marketing Agency.

% of National Quota	Pounds Production Cutback	$ Lost Surplus	$ CCMA Levy	$ Total Loss
	15,000	640,500	0	640,500
	10,000	427,000	0	427,000

*Note: All Calculations done using $42.70 per 1000 pound change in production levels. See Table 7-2.

If Alberta should participate in the Canadian Chicken Marketing Agency it can be seen the the best position would be if the quota allocation was reasonably near to current production levels. Most of the reduced economic surplus in that instance would be due to the additional levies paid.

As discussed in chapter 2, the Canadian Chicken Marketing Agency is in the process of enforcing its Orderly Market Regulations.[111] Enforcement of these regulations would mean that product from Alberta could not pass out of the province for sale in other parts of Canada. Distributors of all interprovincial broiler chicken in Canada will require a permit from the national agency. If Alberta does not participate in the agency it is not likely that processors and distributors will be allocated any interprovincial permits. However, Alberta does not possess the legal rights to refuse admission to product from other products. Interprovincial affairs are federal jurisdiction. The net result is that Alberta product is essentially "trapped" within the province without guarantee that lower priced product will not be flowing into the province. (This possibility will be discussed later.)

Alberta has historically enjoyed the freedom to market interprovincially even thought they have not been a member of the Canadian Chicken Marketing Agency. The national agency has attempted to regulate all other provinces in the meantime. It is entirely possible that Alberta would have had to compete with far more interprovincial "imports" if the Canadian Chicken Marketing Agency had not been established. The establishment of the national agency also meant that import of product from the United States was strictly limited according the the limitations of the GATT agreement.

Essentially, Alberta has been able to enjoy most of the benefits of national stabilization without contributing to its cost by participating. The enforcement of the orderly market regulation is designed to eliminate the means by which Alberta has been able to exist as a free-rider.

It is at this point that the cost of production becomes important. There are no nationwide studies available on cost of production in the broiler industry. Reports conducted by Canada Department of Agriculture - Economics Division (1977), and the Food Prices Review Board (1976) which are referenced in **Broiler Production 1977** both utilized synthetic budgets to derive their figures. The following discussion is an attempt to understand what might be happening to cost of production across Canada.

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[111] The Orderly Market Regulation is described in chapter 3.

B. Cost of Production

As pricing of chicken at the farm gate is conducted by supply controlling agencies in partial accordance with cost of production, the comparison of producer prices across Canada may yield some insight. Table 7-4 compares producer prices across Canada for 1980 and 1981.[112] Farm prices in Alberta were not the highest observed but were higher than noted for Toronto, Montreal and Winnipeg.

The data referenced in **Broiler Production 1977** estimate that costs before investment were approximately the same in Alberta and Ontario (31.85 and 31.49 ¢/lb. respectively). These were noted as the lowest in Canada.[113] The following discussion indicates how these circumstances may have changed in recent years. Members of the broiler industry in Alberta have stated that Alberta currently has one of the highest costs of production in Canada.[114]

Feed and chick are the major components in cost of production. Table 7-5 indicates chick prices across Canada in July 1982. Alberta is noted to have the second lowest average chick cost in Canada. Again, Ontario and this time Quebec appears to have a slight advantage.

Examination of Table 7-6, average retail feed prices across Canada yields more interesting discussion. Feed costs in Quebec may or may not be higher than observed in the prairies depending upon the ration or the year being considered. Feed costs in Ontario are substantially lower than those observed in the prairies and that gap has been increasing in the past three years. The difference between Ontario and Prairie feed prices in 1980 were approx. $10-13 per metric tonne. By 1982, this difference had risen to approx. $26 per tonne.[115] Noting that feed is the major cost component, (approximately 70% of variable costs in the small Alberta survey), this cost differential holds important influence on comparative advantage between the two regions.

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[112] (Note that Alberta 1982 farm price was not significantly different than 1981: 50.27 as opposed to 50.2.)

[113] (B.C. 32.61, Alta. 31.85, Sask. 32.15, Man. 33.37, Ont. 31.49, Que. 34.41, and N.S. 34.55.)
Source: **Broiler Production 1977** p. 52.

[114] Personal communication.

[115] If a feed conversion of 2:1, and average bird weight of 3.75 lbs. (used in later calculations) is assumed, this difference in cost is 2.36¢ per pound produced. If the difference in chick cost is also taken into consideration, Ontario would appear to have an advantage of at least 2.5¢ per pound in cost of production.

Table 7-4: Average Producer Price for Broilers Across Canada (1980-1981)

¢ per Pound Liveweight (to Producer) – Under 5 Pounds

City	1981	1980
Vancouver	51.3	42.9
Edmonton	50.2	43.0
Regina	50.1	43.5
Winnipeg	48.5	42.1
Toronto	49.9	42.8
Montreal	48.0	41.1
Halifax	51.2	44.0

Source: Agriculture Canada, Poultry Market Review.

Table 7-5: Day Old Broiler Chick Prices (July 1982)

¢/chick, f.o.b. farm, 10,000 chick quantities

Provinces	Price
B.C.	37
Alta.	33
Sask.	38
Man.	37
Ont.	32
Que.	32
Atlantic	34

Source: Agriculture Canada, Hatchery Review

Table 7-6: Average Retail Broiler Feed Prices Across Canada (1980-1982)

$/Tonne, F.O.B. Mill Door, Truckload Quantities
Starter (22–24%) : Finisher (18–20%)

Provinces	1982 St.	1982 Fin.	1981 St.	1981 Fin.	1980 St.	1980 Fin.
Prairies	291.88	262.33	307.33	277.00	282.58	255.42
B.C.	301.07	263.78	317.21	296.41	288.11	262.65
Ont.	265.02	236.03	283.55	261.74	269.35	245.97
Que.	287.38	267.19	307.80	285.54	320.07	264.04
Atlantic	310.44	290.75	322.33	306.82	298.32	291.41

Source: Canadian Livestock Feed Board Annual Reports

Another aspect of cost efficiency is scale of operation. As previously discussed, efficiency in utilization of capital and capacity leads to cost savings. In the Alberta broiler

industry, there does not appear to be any gains in feed conversion or return over feed and chick by farm size. These costs are fairly similar for producers of all size.

One of the noted aspects of supply control is the preservation of the small "family" farm. In 1977 the number of farms with greater than 30,000 birds per cycle was fairly small. British Columbia was noted to have the greatest proportion with 32.7%, Quebec with 32.7%, Ontario with 26.0%, and Alberta with the fewest at 18.4%. The Canadian average was cited as 30.7%.[116] As supply control has remained in effect since that data was tabulated, it is not likely that the distribution will have changed a great deal. If there are substantial gains to be made in better utilization of capital and capacity, it is clear from the above comparison that Alberta would fare the least well among those provinces. Table 7-7 shows the size distribution of broiler farms in Alberta. Note that this are size comparisons only, not all of the farms listed are actively producing in 1983. In 1983, 21.78% of the farms were greater than 30,000 square feet per cycle. As Alberta quota allocation is one bird per square foot, this is the same as 30,000 birds per cycle at 100% of quota. Since the 1977 survey, Alberta has increased the number of farms greater than 30,000 square feet by 3.38%. It will be discussed in more detail later in this chapter, but that particular increase is not likely to have meant a large decrease in Alberta's overall cost of production.

If Alberta joined the national agency, national pricing policy would become an important issue. At the present time the Canadian Egg Marketing Agency is renegotiating and recomending changes in a cost of production formula (without much success). It is based on provincial feed, labour, and chick costs, but has national average costs for productivity, overhead, depreciation and producer return. The Canadian Chicken Marketing Agency would likely follow a similar type of cost of production formula. Ontario would have some advantage with the lower feed and chick costs observed in the recent past.

One difference between the Ontario and Alberta industry is the length of production cycle. Alberta has a faster turnover rate with a nine week cycle while Ontario operates in an 11 week cycle. This has, in part, allowed Alberta to maintain their market in spite of other disadvantages.

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[116] Source: Poultry Market Review, 1977.

Table 7-7: Broiler Farm Size Distribution in Alberta (1983)

Square Feet per Cycle

Quota Size '000	No. Broiler Farms	% Of Broiler Total	Distribution	Distribution
0-5	19	11.18		
5-10	12	7.06	54.71	
10-15	40	23.53		78.24
15-20	22	12.94	------	
20-25	32	18.82		
25-30	8	4.71	33.53	-----
30-35	10	5.88		
35-40	7	4.12	------	
40-45	4	2.35		17.64
45-50	4	2.35		
50-55	1	0.59		
55-60	4	2.35	11.76	-----
65-70	1	0.59		
80-90	3	1.76		4.12
100-150	2	1.18		
200+	1	0.59	-----	-----
Total	170			

*There are only two roaster farms listed, 1 between 5000 and 10,000, 1 between 10,000 and 15,000. They are not included in the above table.
*Note that this is NOT the number of producing farms in Alberta.
Source: Alberta Broiler Growers Marketing Board Published Quota List

If Alberta fails to join the Canadian Chicken Marketing Agency, and is subject to the Orderly Marketing Regulations, there will be a restriction on product leaving the province but no restriction can be imposed on product entering the province. In short, Alberta must be competitive in order to survive. The general implication of the discussion here has been that Ontario appears to have a competitive advantage in several key areas: feed cost, chick cost, and relative size of operation.

A closer examination of the transport cost matrix by Holliday included in Appendix B yield some other interesting complications. The cost of shipping from Alberta to Ontario is apparently **more** than the cost of shipping from Ontario to Alberta. If Alberta is not actively shipping product to Ontario, this would be of little concern.

The unit rate of shipping from Ontario to Alberta is only slightly less than to British Columbia. The implication of this is that if Ontario is shipping product into Alberta at all, it is very little extra cost to service the traditional Alberta interprovincial market areas as well. Even though transportation costs from Ontario to British Columbia are double the

cost from Alberta to British Columbia, Ontario could pose competitive threat to Alberta based on a lesser cost of production and/or marketing services.

If Alberta does not participate in the Canadian Chicken Marketing Agency it does not appear that it will compete well with other product in Canada. Those producers with high debt servicing costs will be among those most adversely affected. Similarly, very small producers with high fixed costs relative to their volume of production will experience difficulty.

C. Economies of Scale

This section is intended to estimate differences in cost of production, based on current information and costs, between farm sizes in Albera. The estimation of economies of scale in **Broiler Production 1977** indicated that a saving of 1.6¢ per 100,000 pounds marketed was indicated. The standard error of this estimate was 0.7¢. The "average" farm in the Alberta survey was estimated on a curve of this slope (and associated sensitivity) according to the observed cost of production. Again, as argued before, because it is the change in cost of production that is of interest here, whether or not the cost of production is slightly misjudged will not impart any bias to the changes observed with these calculations.

Table 7-8 indicates the possible gains to be made over the increase in farm size considered. These gains are the difference between assuming a constant cost of production over the size range, and assuming the three different decreasing cost/size scenarios. The results indicate a possible gain between 0.4 and 1.0¢ per pound[117] marketed by producing in a flock size of double the observed sample. If this scenario were taken to the limit of allowable farm size in Alberta, a possible efficiency gain is estimated between 1.5 and 3.7¢ per pound[118] marketed.

If Alberta does not participate in the national agency the industry faces severe competition from interprovincial product. There is little alternative but to take steps toward more efficient production. As noted, Alberta has increased the number of farms with quota greater than 30,000 square feet by only 3.38% since 1977. Alberta remains the province with the smallest average size farm in Canada. Increasing farm size would yield more efficient utilization of inputs, especially capital assets. It is also noted elsewhere that efficient utilization of capital and productive capacity is especially important for new entrants and current producers with large debt servicing.

Unfortunately, coupled with an increase in farm size is a decrease in numbers of farms (if a constant level of production is assumed). Any increase in average farm size needs to be gradual in order that producers are not unfairly displaced. However, it is also clear from the discussion of Alberta's competitive position that an improvement in efficiency is required. Increasing farm size appears to be one method of achieving that.

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[117] (0.88¢ and 2.2¢ per kg.)
[118] (3.3 and 8.14¢ per kg.)

Table 7-8: Possible Gains on Alberta Broiler Farms through Economies of Scale (1983)

Gains made in producer surplus by moving from current average size of farm to maximum size allowed in Alberta.(1)

Assumed Slope	Total Gain ($)	Gain ¢/LB Marketed
1.6	1,299,312	2.5880
0.9	691,488	1.4558
2.3	1,767,136	3.7203

Gains made in producer surplus by doubling the average size of farm in Alberta.(2)

Assumed Slope	Total Gain ($)	Gain ¢/LB Marketed
1.6	58,824.5	0.6860
0.9	33,088.8	0.3859
2.3	84,560.2	0.9861

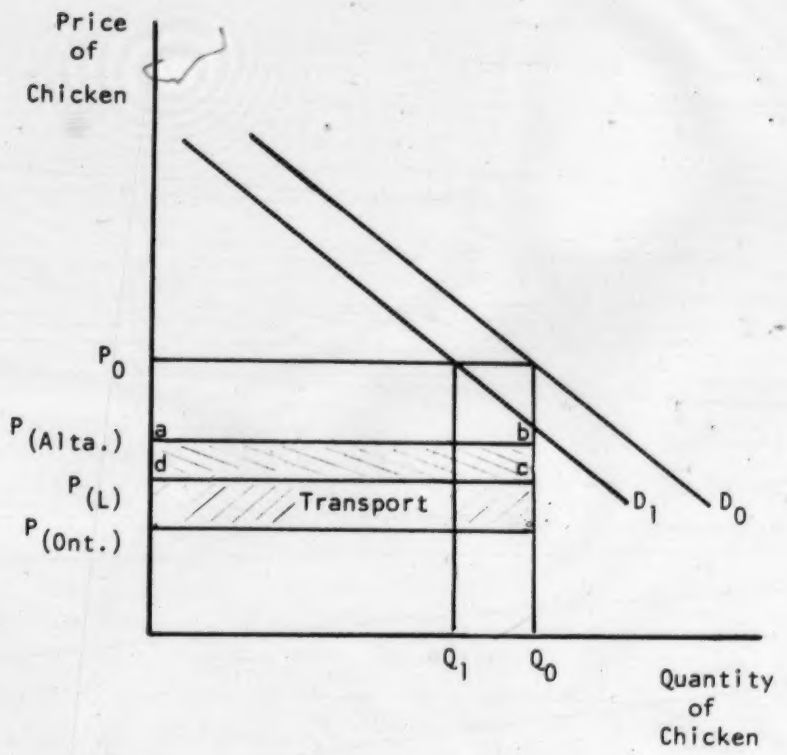
(1) This implies a movement from current average size of approximately 83,000 pounds marketed per cycle to the limit of farm size in Alberta of 475,000 pounds marketed per cycle.
(2) This implies a movement from current average size of approximately 83,000 pounds marketed per cycle to 169,000 pounds marketed per cycle.
Source:Slopes Assumed from **Broiler Cost of Production 1977**, B.C. Select Standing Committee on Agriculture.

Considering that the average size of Alberta farms is so very small, the Alberta Broiler Growers Marketing Board could accomplish such an increase without threatening the nature of the family farm it seeks to preserve.

D. Results of Alternative Scenarios

If Alberta should join the Canadian Chicken Marketing Agency the scenario is fairly straightforward. The market share of national quota would be allotted and the Alberta Broiler Growers Marketing Board would conduct the appropriate adjustments. If Alberta does not participate the results are not so straightforward. As illustrated in Figure 1, the current demand is met at P_0 (retail) and Q_0. If Alberta does not participate in the Canadian Chicken Marketing Agency the loss of interprovincial markets indicates that the size of the consuming population being serviced is reduced. (A parallel shift in the demand schedule from D_0 to D_1.)

Figure 1: Alberta Chicken Market Independent of Canadian Chicken Marketing Agency.



The lost market ($Q_0 - Q_1$) is assumed to be filled by product from provinces participating in the Canadian Chicken Marketing Agency. (Note that this implies no change in the nature of the Alberta market for chicken.) If the scenario is left at this stage, again there are production adjustments which would have to be made by the Alberta Broiler Growers Marketing Board but no real change in the nature of the market. The following discussion outlines the most pessimistic scenario of circumstances which could alter the nature of the market if Alberta does not participate in the Canadian Chicken Marketing Agency.

An independent Alberta will be excluded from interprovincial markets. There is however, no means for Alberta to exclude interprovincial product from the province.

Producer prices, although a component part of final price, are not the final determining price in interprovincial movements. Wholesale or processor prices would be more important in this respect. Published processor prices across Canada for frozen chicken indicated a difference of 13.1¢ per pound between Edmonton (102.7) and Toronto (89.6) in 1981.[119] The 1983 tariff rates for transport of frozen chicken in truckload quantities from Toronto to Edmonton are approximately 11¢ per pound ($11.33 per cwt.).[120] If this same relationship holds true in 1983, it can be seen that processor price in Alberta could still be higher than landed Ontario product without predatory marketing practices. Alberta needs to improve its competitive postion if it is to survive independent of the Canadian Chicken Marketing Agency.

The situation described here is illustrated in Figure 1. Alberta is reduced from supplying Q_0 to Q_1. The difference is filled with product from other provinces. If processor price in Alberta (P(Alta.)) is higher than landed product (P(L)) from elsewhere, especially Ontario (P(Ont.)), the landed product will pose a threat to the Alberta processors.

It would be to the advantage of Alberta retailers and/or consumers to purchase interprovincial product at a lower price (P(L)). (These potential savings are contained in the area ABCD.) Examination of published consumer prices across Canada for the same period (1981) indicated a difference of 16.3¢ per pound between Edmonton (141.5) and Toronto (125.2). It appears that the processor price differential between the two areas is

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[119] **Poultry Market Review 1981**
(Published data for the same across Canada are not available for 1982.)
[120] Industry sources, personal communication.

maintained at the retail level.

As this study is conducted from the producer perspective, differences in chicken market structure and conduct do not form a part of this study. However, it would appear from this information above that Alberta may require improvements in the efficiency of market conduct at other levels as well as in cost of production. Although these figures are a year out of date, there is no indication that circumstances have been radically changed in the past year and a half.

VIII. Summary and Conclusions

Broiler producers in Alberta have enjoyed increasing production levels made possible by increasing population size, and increasing per capita consumption of chicken over the past few years. Alberta has maintained an economic market area which had been serviced prior to the inception of the Canadian Chicken Marketing Agency.

The Canadian Chicken Marketing Agency has experienced difficulty in stabilizing the national production levels and is initiating orderly marketing regulations to bring the situation under control. Even as a non-participant, Alberta has enjoyed some of the benefits of the Canadian Chicken Marketing Agency. To the extent that it has been accomplished, Alberta has been better informed about the market situation as much as it has been stabilized at predictable levels due to operations of the agency. Alberta has also been protected from influx of low priced product that might have entered from the United States if the Canadian Chicken Marketing Agency had not been established. The Canadian Chicken Marketing Agency, in cooperation with the appropriate government agencies, has managed to limit imports at both an internal and internationally acceptable level. Alberta alone could not have accomplished this import restriction.

Estimation of these particular benefits is very difficult. Alberta has essentially been in a free-rider position: enjoying the benefits of the existing national agency without contributing to the costs. These benefits are in some cases intangible. For example, what benefit can be attributed to the goodwill of complete national cooperation?

If the national agency succeeds in enforcing its orderly market regulations it will exclude Alberta from interprovincial markets. If Alberta remains independent, exclusion from interprovincial markets implies a cutback in production and a loss to Alberta producers.

Alberta has historically disregarded national quota allocations to the province and has produced to meet its market requirements. Participation in the Canadian Chicken Marketing Agency would require a cutback in production levels to the allocated quota, and payment of levies to the national agency. In each of the alternative participation scenarios the loss in producer surplus coupled with additional national levies exceeded the loss associated with exclusion from interprovincial markets. Thus it would appear that Alberta would be better off independent in spite of exclusion from interprovincial markets. As

long as Alberta is able to maintain current economic market areas without adverse political repercussions, then it is to their benefit to do so. If full participation was to be at 9.4% of national quota after January 1, 1984, (as allocated in the interim agreement), there would be continuing access to interprovincial markets. This quota allocation would also be equal to Alberta's population (9.4% of Canadian total) and would thereby allow continuing full service to the provincial market.

If Alberta were to remain independent it has no means to exclude product from other provinces and thus would still compete with landed product. It would appear that some provinces in Canada have an advantage over Alberta in feed and chick cost. As average farm size in Alberta is small, Alberta producers could improve their competitve position by increasing farm size to take advantage of economies of scale. This could be accomplished without threatening the nature of the family farm in Alberta.

Product moving into Alberta would be at wholesale or retail level and would include transportation costs. Alberta's ability to compete with interprovincial product on local markets may prove to be as important at the wholesale and retail levels as it is at the farm level. The incomplete analysis of processor prices and transportation costs across Canada indicates a need for further research into the conduct of the marketing system.

Bibliography

Agriculture Canada, Marketing and Economics Branch, Market Information Service, Various Issues, **Poultry Market Review,** Annual.

Agriculture Canada, Marketing and Economics Branch, 1982, Market Information Service, **Hatchery Review.**

Alberta Agriculture, Market Analysis Branch, Various Issues, **Poultry Situation and Outlook,** Quarterly.

Albon, R.P., 1979, "The Real Cost of the B.C. Milk Board: Is it Correctly Measured?", *Canadian Journal of Agricultural Economics,* Vol. 27:44-51.

Appleby, T., 1982, **Alberta Prospects in 1986 and 1991 Under the New CEMA Allocation Policy,** Market Analysis Branch, Alberta Agriculture, Edmonton.

Arcus, P.L., 1981, **Broilers and Eggs,** Economic Council of Canada, Technical Report No. E/13.

Arcus, P.L., 1978, "The Value of Milk Quotas in B.C.: An Economic Analysis", *Canadian Journal of Agricultural Economics,* Vol 26:62-71.

Barichello, R.R., 1981, **The Economics of Canadian Dairy Industry Regulation,** Economic Council of Canada, Technical Report No. E/12.

Borcherding, T., G.W. Dorosh, 1981, **The Egg Marketing Board : A Case Study of Monopoly and Its' Social Costs,** The Fraser Institute, Vancouver.

Boulding, K.E., 1945, "The Concept of Economic Surplus", *American Economic Review,* Vol. 35:851-869.

Brandow, G.E., 1961, **Interrelationships among Demands for Farm Products and Implications for Control of Market Supply,** Pennsylvania State Agriculture Experiment Station, University Park, Pennsylvania, Bulletin No. 680.

Burk, M.C., 1962, "Ramifications of the Relationship Between Income and Food", *Journal of Farm Economics,* Vol. 44:115-125.

Burk, M.C., 1951, "Changes in the Demand for Food", *Journal of Farm Economics,* Vol. 33:281-298.

Burnstein, H., 1977, **Welfare Implications of Instability in Agricultural Commodity Markets,** Pennsylvania State University, Department of Agricultural Economics and Rural Sociology, Paper #132.

Buse, R.C., 1958, "Total Elasticities - A Predictive Device", *Journal of Farm Economics,* Vol. 40(I):881-891.

Canada Gazette, Government of Canada, Queens Printer, Ottawa, various issues.

Canada Poultryman, Farm Papers Ltd., New Westminster, B.C., various issues.

Canadian Livestock Feed Board, Annual Reports, various issues.

Cassels, J.M., 1933, "The Nature of Statistical Supply Curves", *Journal of Farm Economics,* Vol. 15:378-387.

Chang, H., 1977, "Functional Forms and the Demand for Meat in the United States", *Review*

of Economics and Statistics, Vol. 59:355-359.

Chavas, J.P., 1982, "On the Use of Price Ratio in Aggregate Supply Response: Some Evidence from the Poultry Industry", *Canadian Journal of Agricultural Economics*, Vol. 30(3):345-358.

Chavas, J.P., S.R. Johnson, 1982, "Supply Dynamics: The Case of U.S. Broilers and Turkeys", *American Journal of Agricultural Economics*, Vol. 64(3):558-564.

Chavas, J.P., Z.A. Hassan, S.R. Johnson, 1981, "Static and Dynamic Elasticities and Flexibilities in Systems of Simultaneous Equations", *Journal of Agricultural Economics*, Vol. 32:177-187.

Copeland, J., 1974, "A Study of Broiler Marketing in Alberta", M.Sc. Thesis, University of Alberta, Department of Rural Economy and Rural Sociology.

Currie, J.M., J.A. Murphy, A. Schmitz, 1971, "The Concept of Economic Surplus and Its' Use in Economic Analysis", *The Economic Journal*, Vol. 81:741-799.

Dean, G.W., E.O. Heady, 1958, "Changes in Supply Response and Elasticity for Hogs", *Journal of Farm Economics*, Vol. 40(I):845-860.

De Leeuw, A.J., 1973, **A Descriptive Study of the Marketing Boards in British Columbia,** M.B.A. Thesis, Faculty of Commerce and Business Administration, University of British Columbia, Vancouver.

Farris, P.L., R.D. Darley, 1964, "Price-Quarterly Relations for Broilers at the Farm Level", *Journal of Farm Economics*, Vol. 46:849-856.

Fisher, M., 1958, "A Sector Model of the Poultry Industry of the U.S.A.", *Econometrica*, Vol. 26:37-76.

Foote, R.J., 1955, "A Comparison of Single and Simultaneous Equation Techniques", *Journal of Farm Economics*, Vol. 37:975-990.

Foote, R.J., 1958, **Analytical Tools for Studying Demand and Price Structure, U.S.D.A. Agriculture Handbook No. 146.**

Forbes, J.D., R.D. Hughes, T.K. Warley, 1982, Economic Intervention and Regulation in Canadian Agriculture, Economic Council of Canada and The Institute for Research on Public Policy.

Fox, K.A., 1954, "Structural Analysis and the Measurement of Demand for Farm Products", *Review of Economics and Statistics*, Vol. 36:57-66.

Funk, T.F., M.T. Rice, 1978, "Effects of Marketing Boards on the Agricultural Business Sector", *American Journal of Agricultural Economics*, Vol. 60:894-898.

Gardner, B.L., 1979, "Determinants of Supply Elasticity in Interdependent Markets", *American Journal of Agricultural Economics*, Vol. 61(3):463-475.

George, P.S., G.A. King, 1971, **Consumer Demand for Food Commodities in the United States with Projections for 1980,** University of California, Davis, Giannini Foundation Monograph No. 26.

Gislason, C., 1957, "A Note on Long Run Price Elasticity", *Journal of Farm Economics*, Vol. 39:798-802.

Goreux, L.M., 1960, "Income and Food Consumption", *Monthly Bulletin of Agricultural Economics and Statistics*, Vol. 9:1-13.

Government of Alberta, *The Marketing of Agricultural Products Act-1955*, Statutes of

Alberta, 1955, Ch. 225.

Government of Alberta, *The Marketing of Agricultural Products Amendment Act-1972*, Statutes of Alberta, 1972, Ch. 65.

Government of Alberta, *Alberta Regulation 33/68*, The Marketing of Agricultural Products Act.

Government of Canada, *The Farm Products Marketing Agencies Act-1972*, Statutes of Canada, 1972, Ch.65.

Grosh, G., G.R. Milne, D. Potter, A. Rendfleisch, 1978, **Implications of Participation In / Withdrawal from the Canadian Turkey Marketing Agency By the Alberta Turkey Marketing Board,** Economic Research Report, Government of Alberta, Mimeo.

Grubel, H.G., R.D. Schwindt, 1977, **The Real Cost of the B.C. Milk Board,** The Fraser Insititute, Vancouver.

Harberger, A., 1971, "Three Basic Postulates for Applied Welfare Economics: An Interpretive Essay", *Journal of Economic Literature*, Vol. 9:785-797.

Harberger, A., 1954, "Monopoly and Resource Allocation", *American Economic Review*, Proceedings Vol.44:7787.

Hassan, Z.A., S.R. Johnson, 1983, "Quarterly Demands for Meat in Canada with Alternative Seasonality Hypotheses", *Canadian Journal of Agricultural Economics*, Vol. 31:77-94.

Hassan, Z.A., S.R. Johnson, 1979, "The Demand for Meat in Canada: An Application of the Transformation of Variables", *Canadian Journal of Agricultural Economics*, Vol. 27(3):1-12.

Hassan, Z.A., S.R. Johnson, 1976, **Consumer Demand for Major Foods in Canada,** Agriculture Canada, Economics Branch Publication No. 76/2, Ottawa.

Hassan, Z.A., L. Katz, 1975, "The Demand for Meat in Canada", *Canadian Journal of Agricultural Economics*, Vol. 23:53-63.

Hassan, Z.A., W.F. Lu, 1974, **Food Consumption Patterns in Canada**, Agriculture Canada, Economics Branch, Ottawa, Pub. No. 74/8.

Hausman, J.E., 1981, "Exact Consumer's Surplus and Deadweight Loss", *American Economic Review*, Vol. 71:662-676.

Heien, D., 1976, "An Economic Analysis of the U.S. Poultry Sector", *American Journal of Agricultural Economics*, Vol. 58:311-316.

Hicks, J.R., 1941, "The Rehabilitation of Consumers Surplus", *Review of Economic Studies* Vol. 9:108-116.

Hicks, J.R., 1943, "The Four Consumer's Surplus's", *Review of Economic Studies* Vol. 11:34-41.

Holliday, D.C., 1978, "An Analysis of the Economic Relationships in the Canadian Broiler Industry", in **Commodity Forecasting Models for Canadian Agriculture,** Hassan, Z.A. & H.B. Huff (Eds.), Agriculture Canada, Information Services Publication No 78/3, Ottawa.

Holmes, R.A., 1968, "Combining Cross-Section and Time-Series Information on Demand Relationships for Substitute Goods", *American Journal of Agricultural Economics*, Vol. 50:56-65.

Ironmonger, D.S., 1959, "A Note on The Estimation of Long Run Elasticities", *Journal of Farm Economics*, Vol. 41:626-632.

Johnson, D.G., 1950, "The Nature of the Supply Function for Agricultural Products", *American Economic Review*, Vol. 40"539-564.

Johnson, G.L., 1960, "The State of Agricultural Supply Analysis", *Journal of Farm Economics*, Vol. 42:435-452.

Johnson, G.L., 1958, "Supply Functions - Some Facts and Notions", in **Agricultural Adjustments in a Growing Economy**, (Eds.) E.O. Heady, H.G. Dresslin, H.R. Jensen, G.L. Johnson, Ames - Iowa Univ. Press, p. 74-93.

Johnson, G.L., C.L. Quance, 1972, **The Overproduction Trap in U.S. Agriculture,** John Hopkins Univ. Press, Baltimore.

Johnson, T.G., J. Spriggs, G.C. VanKooten, 1982, "Social Costs of Supply-Restricting Marketing Boards: A Comment", *Canadian Journal of Agricultural Economics*, Vol. 30(3):369-372.

Kottke, M., 1969, "Discussion: The Supply Function in Agriculture Revisited", *American Journal of Agricultural Economics*, Vol 51:364-366.

Koutsoyiannis, A., 1977, **Theory of Econometrics,** Macmillan Press Ltd.

Kuznets, G.M., 1953, "Measurement of Market Demand with Particular Reference to Consumer Demand for Food", *Journal of Farm Economics*, Vol. 35:878-895.

Ladd, G.W., J.R. Tedford, 1959, "A Generalization of the Working Method for Estimating Long Run Elasticities", *Journal of Farm Economics*, Vol. 41:221-233.

Learn, E.W., 1956, "Estimating the Demand for Livestock Products at the Farm Level", *Journal of Farm Economics*, Vol. 38:1483-1491.

Lee, B.M., 1973, **An Econometric Analysis of Factors Influencing Demand and Prices in the Canadian Poultry Meat Industry,** M.Sc. Thesis, Dept. of Agricultural Economics, Univ. of Manitoba, Winnipeg.

Lipsey, R.G., K. Lancaster, 1956, "The General Theory of the Second Best", *Review of Economics and Statistics*, Vol. 24:11-32.

Logan, S.H., J.N. Boles, 1962, "Quarterly Fluctuations in the Retail Prices of Meat", *Journal of Farm Economics*, Vol. 44:1050-1060.

Loyns, R.M.A., 1976, "The Role and Impact of Marketing Boards in Agricultural and Food Stability", **Canadian Agricultural Economics Society Workshop Proceedings,** *Canadian Journal of Agricultural Economics*, Vol. 24.

Loyns, R.M.A., 1972, "What Farmers should know about Bill C - 176", Research Bulletin AE/2/72, Department of Agricultural Economics, University of Manitoba, Winnipeg.

Loyns, R.M.A., 1971, "A Comparison of Legislative Aspects of Agricultural Market Regulation in Canada and the U.S.", *Canadian Journal of Agricultural Economics*, Vol. 19:35-46.

Manderscheid, L.V., 1964, "Some Observations on Interpreting Measured Demand Elasticities", *Journal of Farm Economics*, Vol. 46:128-136.

Martin., L.J., T.K. Warley, 1978, "The Role of Marketing Boards in Stabilizing Commodity Markets", *American Journal of Agricultural Economics*, Vol. 60(2):878-884.

Mishan, E.J., 1969, "Rent and Producter's Surplus: Reply", *American Economic Review*,

Vol. 59:635-637.

Mishan, E.J., 1968, "What is Producer's Surplus ?", *American Economic Review*, Vol. 58:1267-1282.

Mishan, E.J., 1959, "Rent as a Measure of Welfare Change", *American Economic Review*, Vol. 49:386-395.

Nerlove, M., 1979, "The Dynamics of Supply: Retrospect and Prospect", *American Journal of Agricultural Economics*, Vol. 61:874-888.

Nerlove, M., 1959, "On The Estimation of Long Run Elasticities - A Reply", *Journal of Farm Economics*, Vol. 41:632-640.

Nerlove, M., 1958, "Distributed Lags and Estimation of Long Run Supply and Demand Elasticity - Theoretical Considerations", *Journal of Farm Economics*, Vol. 40:301-311.

Nerlove, M., W. Addison, 1958, "Statistical Estimation of Long Run Elasticities of Supply and Demand", *Journal of Farm Economics*, Vol. 40:861-880

Ontario Ministry of Agriculture and Food, 1979, **An Analysis of the Costs and Benefits to Ontario of Participation in the National Supply Management Programme for Industrial Milk,** Economic Research Report, Queens Park, Toronto.

O'Regan, W.G., 1955, "Demand for Meat - Comment", *Journal of Farm Economics*, Vol. 37:752-755.

Pasour, E.C., R.A. Schrimper, 1965, "The Effect of Length of Run on Measured Elasticities", *Journal of Farm Economics*, Vol. 47:774-788.

Plain, R.M., C.C. Haukedal, 1981, **An Overview of Marketing Board Legislation and Structure in the Province of Alberta,** Department of of Economics, University of Alberta, Edmonton.

Poetschke, L.E., W. Mackenzie, 1957, **The Development of Producer Marketing Boards in Canadian Agriculture,** Department of Political Economy, University of Alberta, Edmonton.

Rhodes, J.V., 1978, **The Agricultural Marketing System,** Grid Publishing Co., Columbus, Ohio.

Richter, J.J., 1973, "Constitutional and Institutional Constraints in Agricultural Policy", *Canadian Journal of Agricultural Economics*, Vol. 21:49-56.

Rima, I.H., 1978, **Development of Economic Analysis,** Irwin-Dorsey Ltd., Georgetown, Ontario.

Select Standing Committee on Agriculture, Research Staff, 1978, **Primary Agriculture in British Columbia: Broiler Production 1977,**.

Shultz, T.W., 1956, "Reflections on Agricultural Production, Output and Supply", *Journal of Farm Economics*, Vol. 38:613-631.

Stanton, B.F., 1961, "Seasonal Demand for Beef, Pork, and Broilers", *Agricultural Economics Research*, Vol. 13:1-14.

Statistics Canada, 1982, **Estimates of Population for Canada and the Provinces - June 1, 1982,** 91-201 Annual.

Statistics Canada, various issues, **Production of Poultry and Eggs,** 23-202 Annual.

Tomek, W.G., 1965, "Changes in Price Elasticities of Demand for Beef, Pork and Broilers", *Journal of Farm Economics*, Vol 47:793-802.

Tryfos, P. N. Tryphonopoulos, 1973, "Consumer Demand for Meat in Canada", *American Journal of Agricultural Economics*, Vol. 55:647-652.

Tullock, G., 1975, "The Transitional Gains Trap", *Bell Journal of Economics*, Vol. 6:671-678.

Tweeten, L.G., C.L. Quance, 1969, "Positivistic Measures of Aggregate Supply Elasticities: Some New Approaches", *American Journal of Agricultural Economics*, Vol. 51:342-352.

Veeman, M.M., 1982a, "Social Costs of Supply-Restricting Marketing Boards: Reply", *Canadian Journal of Agricultural Economics*, Vol. 30(3):373-376.

Veeman, M.M., 1982, "Social Costs of Supply - Restricting Marketing Boards", *Canadian Journal of Agricultural Economics*, Vol. 30(1):21-36.

Veeman, M.M., R.M.A. Loyns, 1979, "Agricultural Marketing Boards in Canada", in **Agricultural Marketing Boards,** S. Hoos (Ed.), Ballinger Publishing Co., Cambridge, Mass., pp. 59-77.

Veeman, M.M., T.S. Veeman, 1980, **Marketing Boards in Western Canada,** Canada West Foundation Publication No. C.W.F.80-129.

Walker, H.W., 1968, "Marketing Boards and Quota Policies For Canadian Farm Products: An Appraisal of Performance", *Canadian Journal of Agricultural Economics*, Vol. 16:1-12.

Wessel, R.H., 1969, "What is Producer's Surplus: - Comment", *American Economic Review*, Vol. 69:634-635.

Wessel, R.H., 1967, "A Note on Economic Rent", *American Economic Review*, Vol. 57:1221-1226.

White, J.H., 1969, " Discussion: The Supply Function in Agriculture Revisited", *American Journal of Agricultural Economics*, Vol. 51(l):361-264.

Wood, J.W., 1963, "Some Aspects of the Marketing and Pricing of Broilers in Ontario", *Canadian Journal of Farm Economics*, Vol. 11(1):49-51.

Worcester, D.A., 1946, "A Reconsideration of Rent Theory", *American Economic Review*, Vol. 36: 258-277.

Working, E.J., 1955, "How Much Progress Has Been Made in the Study of Demand for Farm Products?", *Journal of Farm Economics*, Vol. 37:968-974.

Working, E.J., 1954, **Demand for Meat,** Chicago Institute of Meat Packing.

Working, E.J., 1927, "What Do Statistical Demand Curves Show?", *Quarterly Journal of Economics*, Vol. 41:212-235.

Appendix A

Social Cost Estimation

Estimation of social costs is a study unto itself. In general a supply restriction is associated with an increase in consumer price until supply once again meets demand at the new price. In Figure 2 this would be represented by the movement from p^0q^0 to p^1q^1. The triangle ABC is usually referred to as efficiency or deadweight loss – that surplus which is rendered unavailable to either producers (area AGB) or consumers (area AGC). A common error is to assume that the value of quota is embodied in the area BCDF. Quota value represents the value of the rights to produce a commodity for an infinite length of time, or, the length of time that producers believe those benefits will exist. Due to the supply restriction, equilibrium price is raised from p^0 to p^1. Clearly price would never stabilize at the lower level of px therefore supply control measures would not be embodied in the producer surplus area EFBG (which existed prior to supply control). Quota values are embodied in the area GCDE only. Arcus (1981) argues that as quota values are uniquely determined in Canada they are the best estimate of producer benefits due to supply restriction that are likely to be available. To a certain extent this argument holds some merit where quotas are freely traded. However, where quotas remain the property of the controlling organization, the benefits of supply restriction are more likely to be capitalized into other assets, particularly land or buildings & equipment which the organization does not control. These are much more difficult to analyze.

A further problem with the existence of benefits is the distribution of those benefits. Clearly any new entrant to the industry must either purchase quota, or other capital assets at inflated prices. The cost structure for the new entrant is therefore much different than that of the existing producers. Some boards attempt to minimize this internalization of benefits into capital assets by NOT guaranteeing that quota will automatically transfer with farm sale. This does not rule out speculation, and there have been few cases of large farm sales without the new entrant receiving quota. On Figure 2 this would be represented by the shift from S_0 to S_1 if quota were completely internalized in the cost structure. If the quota were not completely internalized by the cost structure was distorted the shift would be represented in Figure 2 from S_0 to S??. In any case, if the

valuation of other factors of production is influenced by the existence or non-existence of quota values, the marginal cost curve for new entrants clearly will not be the same as that for existing producers. The net result of this situation is a transfer from new entrants to exiting producers.

Quota values are a highly charged issue. A recent scathing editorial[121] on quota values dismissed economic models as unrealistic.

> "In the poultry business, the price that quota sells for is the highest price that anyone will possibly pay for the quota. This price is high for several reasons other than the assumption that there are excess profits to be made in the business.
>
> Very little quota is actually sold to new producers. Instead quota is often bought by people who have land, housing, equipment and labour available. Thus the only extra fixed cost in expanding production is the quota itself. The fact that such people are willing to pay exorbitant prices for quota does not mean that every quota unit can be assessed at that worth. Quotas are only worth that much to the very few people who are buying. There is no provision for quota value in cost of production pricing and in all likelihood, anyone who borrows heavily to buy a farm plus quota in today's market, will lose money and probably go broke."

Carrying this type of reasoning to the extreme, all factors of production will eventually have to exchange ownership after existing operators reach retirement. Due to the internalization of the quota values into the cost structure through direct purchase or indirectly through the capital assets, the supply curve would become fixed at S_1, equilibrium quantity would then be permanently reduced and equilibrium price permanently raised.[122]

If equilibrium output is permanently reduced, the only opportunity for development of economies of scale or better utilization of productive capacity would come about through (consuming) population increase, export market development, etc. If this scenario did occur, and export markets were not developed, the underlying industry supply curve would then be negatively sloped.

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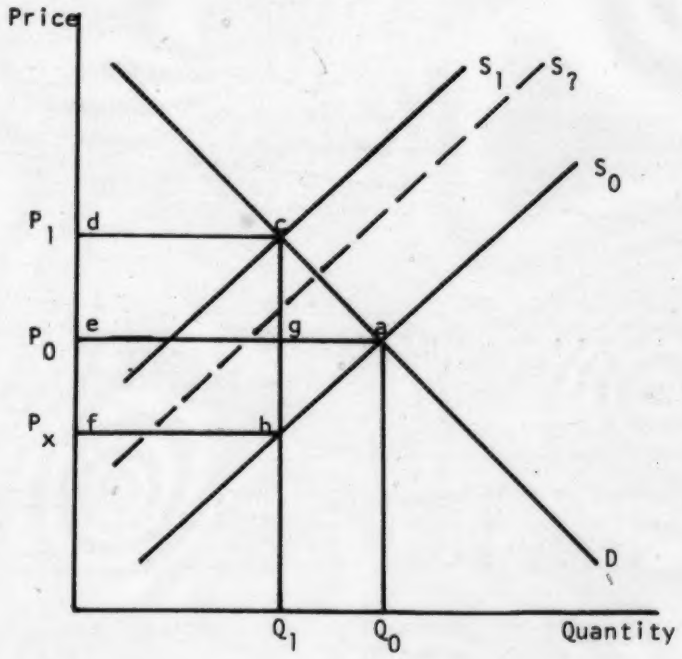
[121] "Quota Values", *Canada Poultryman*, Vol.68(11):3, November 1981.

[122] Tullock (1975) describes this problem as a transitional gains trap "... there are only transtitional gains to be made when the government establishes special priveleges for a group of people. The successors to the original beneficiaries will not normally make excess profits; but unfortunately they will usually be injured by the cancellation of the gift. (p. 671.)

Figure 2: Social Costs Associated With Supply Restriction



Appendix B

Transport Cost Matrix for 1975 Derived by Holliday (1976)

The transportation cost matrix represents estimates of the unit cost of shipping broiler products among the specified regions.

To:	B.C.	Prairies	Ont.	Que.	Maritimes	U.S.A.
From:						
B.C.	0	2.34	4.39	4.94	6.86	3.28
Prairies	2.34	0	6.40	6.40	7.04	3.28
Ont.	5.18	4.93	0	1.65	3.26	3.28
Que.	5.70	5.42	1.65	0	1.56	2.92
Maritimes	8.74	8.46	2.56	1.92	0	2.92
U.S.A.	5.49	5.49	6.56	6.56	6.56	0

Source: Holliday (1976) p. 77.

Appendix C

Per Capita Consumption of Meat and Poultry in Canada

Eggs included as dozens of eggs consumed.
Meat and Poultry included as pounds eviscerated weight.

Year	Chicken (Lbs.)	Turkey (Lbs.)	Eggs (Dozens)	Beef (Lbs.)	Pork (Lbs.)
1981	37.7	9.2	18.4	90.2	69.4
1980	38.1	9.5	18.7	87.7	71.3
1979	39.0	9.7	18.9	88.1	65.5
1978	35.4	9.2	18.2	100.7	57.7
1977	33.6	9.2	18.6	107.9	55.5
1976	32.1	9.1	19.7	113.2	53.3
1975	29.1	9.4	19.4	107.0	55.3
1974	31.4	10.6	19.5	96.3	62.1
1973	32.8	10.2	19.4	92.7	59.3
1972	31.4	10.4	20.5		
1971	29.9	10.3	21.3		
1970	31.3	10.1	21.7		
1969	28.6	10.0	21.7		
1968	25.2	9.8	21.3		
1967	25.5	10.4	21.2		
1966	24.1	10.3	20.5		
1965	22.2	9.5	21.3		
1964	21.3	8.6	21.6		
1963	19.6	8.3	21.5		

Source:Chicken, Turkey and Eggs consumption figures from Agriculture Canada, *Poultry Market Review*, various issues.
Beef and Pork consumption figures from Statistcs Canada, 23-202 Annual, 1981.